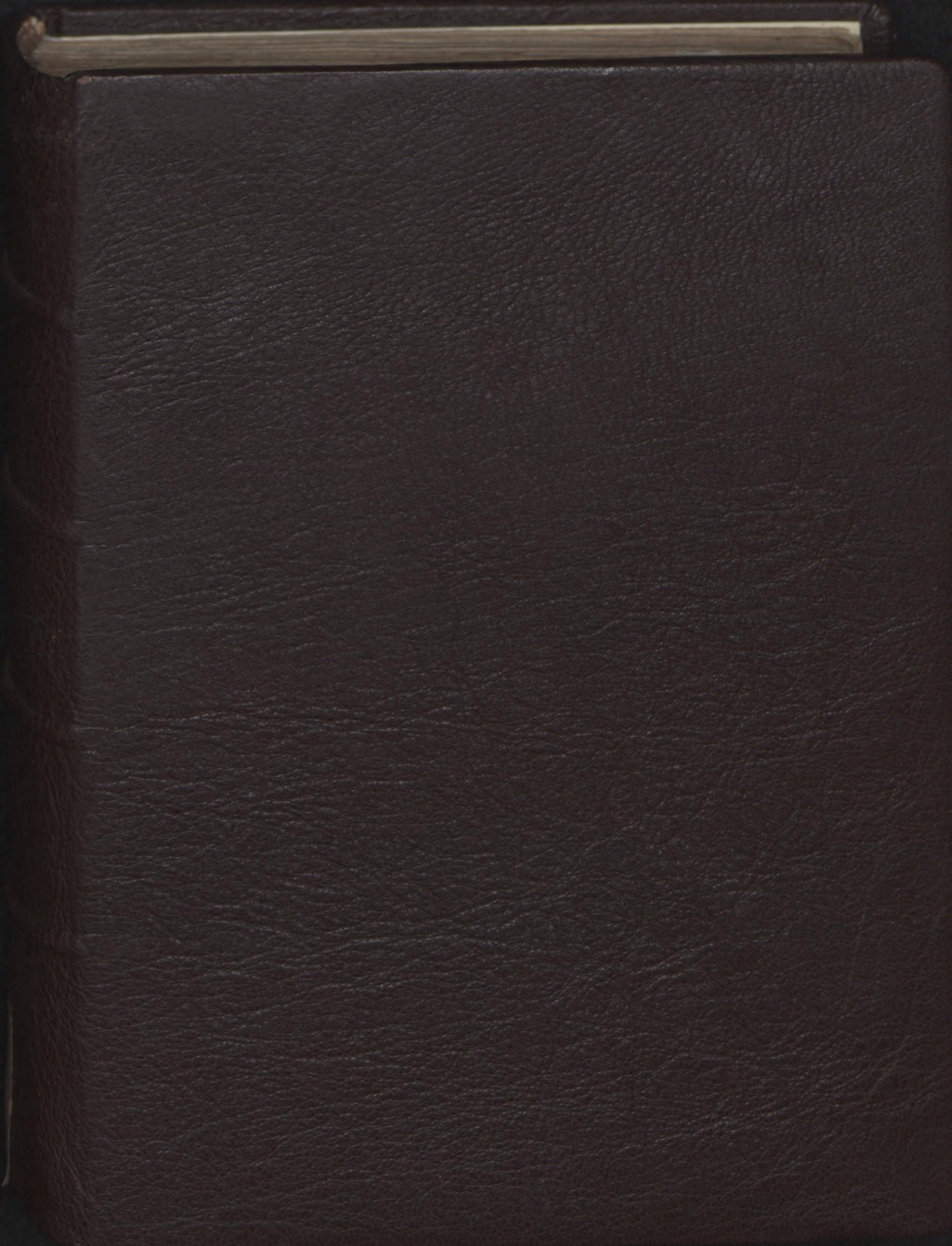

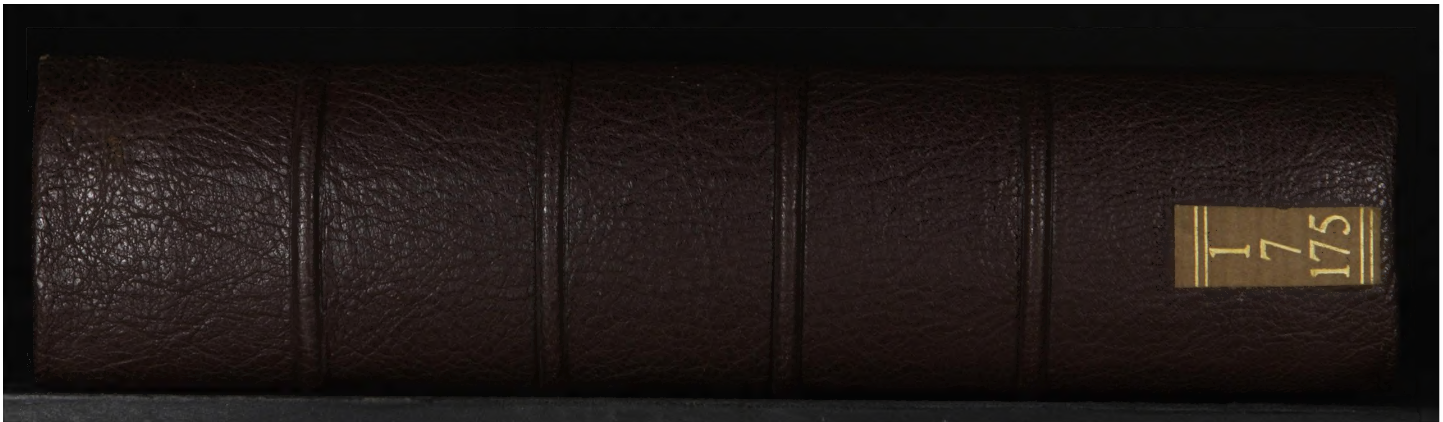
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Bartholomæi
Pitisci Grunbergensis
Silesij.
TRIGONOMETRIÆ
Siue
De dimensione Triangulorum
LIBRI QVINQVE. Item
PROBLEMATVM VARIORV.
nempe
Geodæticorum,
Altimetricorum,
Geographicorum,
Gnomonicorum, et
Astronomicorum:
LIBRI DECEM.
EDITIO TERTIA:
Cui recens accessit Pro-
blematum Architecto-
nicorum liber
unus.
FRANCOFURTI.
Typis Nicolai Hofmanni
Sumptibus Ionæ Rosæ.
M DC XII.
A 1

Auctor Lectori S.

In hac tertia Trigonometriæ meæ editione, præter vetera omnia nitidius impressa, hæc duo insunt plane nova:

I. Inventio subtensæ, tertiæ vel quintæ, vel cujuscunq; imparis partis alicujus arcus, ex data sola subtensa illius arcus; etiam per communem Arithmeticam, & sine omni adminiculo Algebræ. Quæ inventio hactenus credita fuit impossibilis.

II. Liber Problematum Architectonicorum, in quo præcipua Architecturæ militaris mysteria reserantur.

Quæ duo, qualia sint, & quanti precii, malo te ex tuo sensu, quàm ex verbis meis æstimare. V.

II

ILLVSTRISSIMO PRINCIPI AC DOMINO,

DOMINO FRIDERICO IV.

COMITI PALATINO AD RHENUM, S. RÔM. IMPERII ARCHIDApifero & Electori, Duci Bavariæ, &c. Domino suo Clementissimo.

ILLVSTRISSIME Princeps Elector, Domine Clementissime, Nisi nota esset Illustrissimæ Celsitudini Tuæ tota vita mea; prolixè me excusarem, quod ego homo Theologus, quasi oblitus vocationis meæ, & Mathesin excolam, & eius generis scripta in lucem edam. Nec enim dubito, quin multi sint hoc studium meum calumniaturi, nisi paratam mihi apud Illustrissimã Celsitudinem Tuam defensionem esse sciant. Et certè si ego tempus, quod

meditationi rerum divinarum debeo, in dinumerationem astrorum conferrem, culpa minimè vacarem. Nunc autem, quando non aliis horis hæc ago, quàm quibus horis alij ociantur: nec in alium finem, quàm ut Illustrissimæ Tuæ Celsitudini, de his rebus crebrò sciscitanti, promptè & dextrè respondere possim: quis est qui vel lusus meos ingenuos aliorum desidiæ postponat, vel voluntatem Illustrissimæ Celsitudinis Tuæ cõmodis inserviendi reprehendat? Abrahamo Patriarchæ laudi datur à Josepho, quòd & ipse mathematicas artes calluerit, & alios in iisdem instituerit. Et in encomiis Danielis hoc non est postremum, quòd instructus fuerit omni sapientia Chaldæorum: quæ sapientia præcipuè in mathesi consistebat. Neq; minus Theologis, quàm aliis quibuscunq; hominibus opera Dei idcirco sunt proposita, ut iis contemplandis sapientiam Dei admirari, potentiam metuere, & bonitatem magnifacere discant. Omnes autem isti affectus sine dubio tantò sunt ferventiores, quanto intelligentia operũ divinorum est in homine pio maior. Intuetur idiota quispiam Solem: miratur claritatem lucis: potestatem caloris: velocitatem cursus: certitudinem itine-

itineris: nescius interim, quæ sit forma & magnitudo Solis, & quam longinquum iter, quod quotidie permeat. Si eidem dicas, & ex Astronomia demonstres: Solē esse globum, globo terreno centies sexagies sexies maiorē; & circulum cursus ipsius quotidiani cōtinere plus quam quadragies centena millia milliarium Germanicorū: non amplius admirabitur, sed plane obstupescet ad tanta naturæ miracula; & exclamabit cum Davide: Iehova Deus noster, quā admirabile est nomen tuum in universa terra! Et, quid est homo, quod tu, tantarū rerum conditor & effector, es memor eius? Adde, quod semper ita iudicatum est, post arcanam operationem Spiritus Dei, nihil esse quod hominē mansuetiorem reddat, quā cœlestis illius Philosophiæ cultura. Mansuetudo autem bone Deus, quantum, & quam rarum est Theologorum ornamentum! Et quam optandum esset hoc seculo, omnes Theologos esse mathematicos, hoc est, homines tractabiles & mansuetos. Quanquam, ne quis meo exemplo abusus plus nimio his speculationibus tribuat; & interim officium suum negligat: aperte fateor, ut privata & modica harū rerum exercitatio nemini nocet: ita publicā & assi-

duam earum tractationē non posse non aliquid incommodi afferre ijs, qui & corporis & ingenij vires aliis laboribus exantlandis integras cōservare debēt. Quod cum hoc semestri deprehendissem: & ipse mihi proposui, nihil amplius in hoc genere scribere, & aliis mei ordinis hominibus, ut idem sibi proponant, autor sum. Verè enim Ludovicus Vives: Ingenium, inquit, vividius est, non nimis defatigatū. Et severè Christus: Mortui, inquit, sepeliant mortuos suos, tu autem vade & annuncia regnum Dei. Hoc igitur deinceps agamus. Quæ verò huc usq; scripsi, quia non tantum Tibi, Jllustrißime Princeps Elector, sed & aliis multis usui esse possunt; cur invidiose premam? Id enim absq; iactantia me dicere posse confido, doctrinam Triangulorū in hunc usq; diem à nemine tam perspicuè explicatam, & usum eius in tot artibus, tam familiariter monstratū esse. Præsertim delectabit, sat scio, omnes rectè iudicantes, quod in problematib9 de motu Solis & Lunæ videbunt, motus cœlestes omnes (nam cæterorum eadem est ratio) absque omni tàm Alphonsinarum, quàm Prutenicarum tabularū ope, per solum Canonem Triangulorum; & per cōmunem Arithmeticam, eadem

eadem facilitate, certitudine autem & iucũditate, quàm per tabulas, multo maiore, supputari posse. Qua ex re etiam Celsitudinem Tuam maximam suo tempore voluptatem capturam esse minimè dubito. Postquam enim Arithmeticam Celsitudo Tua totam perdidicit: & in Geometria etiam fundamẽta non cõtemnenda iecit: nihil impedire poterit, quo minus etiam istam scientiã superstruat, qua nomen plusquam regium sibi ad omnem posteritatem esset comparatura. Quò rariores enim sunt Principes, qui hæc intelligant: tanto maior laus est, si intelligãt. Et scit Illustrissima Tua Celsitudo, Illm suũ avunculum, VVilhelmum, p. m. Hassiæ Landgravium, etsi aliis quoq; rebus gestis clarus esset, non aliunde tamen maius, quam ex Astronomiæ studio nomen sibi acquisivisse. De Alphonso verò Castellæ Rege vulgò notum est, eius memoriam iam pridem fuisse sepultam, nisi Tabulæ cœlestium motuum ipsius cura & sumtibus editæ in literatorum manibus versarentur. Hos igitur laudatissimos Reges & Principes imitari, laudem vere regiam esse, Illustrissima Celsitudo Tua putet. Quam ad rem si quid ego cõferre potero: non patiar, vel fidem, qua Illustrissimæ

Tuæ

Tuæ Celsitudini sum obstrictus, vel industriã, unquam in me desiderari. Etsi n. publice hæc tractare deinceps, ut supra dixi, nolo: Illustrissimæ tamẽ Celsitudini Tuæ, *si quid etiã porro de rebus istis ex me scire cupiat, deesse neque debeo neq; volo. Præsertim postquam tot annos tot beneficiis una cum tota familia mea ab Illustrissima Celsitudine* Tua *sum affectus. Pro quibus beneficiis, quia eorum magnitudini officiola mea neutiquam respondent; Deum oro, ut divitiis gratiæ suæ ea compensare, & Illustrissimam Celsitudinẽ* Tuam, *una cum laudatissima ipsius coniuge, & prole numerosa, omni benedictione, tam corporali, quam spirituali, perpetuo prosequi dignetur. Cuius mei animi & voti hæc nuncupatio testis esto. Perscriptum Hagenbachii, in comitatu aulæ Illustrissimæ Celsitudinis* Tuæ, *Anno N.C. 1599. die 12. Septembr.*

Illustrissimæ C. T.

humilimus &
addictissimus servus

B. Pitiscus.

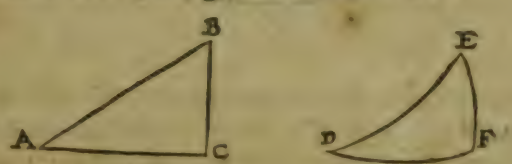
BARTHOLOMÆI PITISCI GRUNBERGENSIS TRIGONOMETRIÆ

LIBER PRIMVS.

De generibus & affectionibus Triangulorum.

I. Trigonometria eſt doctrina de dimenſione Triangulorum.

II. Triangulum eſt figura tribus lateribus tres angulos comprehendens: *Vt ſunt figuræ ABC & DEF.*



III. Latera duo quælibet ſunt crura anguli à ſe comprehenſi: tertium, baſis. *vt latera AB & AC ſunt crura anguli BAC: latus BC eſt eiuſdem anguli baſis.*

IV. Latus vnumquodq; dicitur ſubtendere angulum ſibi oppoſitum. *Vt latus AB ſubtendit angulum ACB. Latus AC ſubtendit angulum ABC. Latus BC ſubtendit angulum BAC.*

V. Latera maiora maiores angulos ſubtendunt. *Subintellige:* Et minora minores, & æqualia æquales. *Veritas theorematis per ſe manifeſta eſt. Demonſtratur tamen apud Euclidem ad 18. & 19. p. 1. & apud Regiomontanum ad 42. & 43. prop. 3. Luculenter etiam confirmabitur infra per ſecundũ axioma libri tertii, & per tertium quarti.*

VI. Anguli menſura eſt circuli ex angulari puncto deſcripti arcus, inter crura ſatis prolongata interceptus: *Vt, in Triangulo ABC, anguli BAC menſura eſt arcus OP vel BD.*

VII. Circulus in trigonometria omnis diuiditur in partes ſiue gradus 360. & gradus ſinguli rurſum in 60. ſcrupula, ſiue minuta prima, & vnum primum in totidem ſecunda, &c. Quæ partes tanto ſunt maiores, quanto circulus eſt maior. Arcus autem, qui eodem partium numero conſtant, in circulis æqualibus æquales, in circulis inæqualibus ſimiles dicũtur: *Vt, arcus BD & GH ſunt æquales: arcus verò BD & OP ſunt ſimiles. Sicut enim BD, verbi gratia, eſt 40 partium in circulo magno EBD: ita OP eſt 40. partium in circulo parvo LOP. &c.*

VIII. Igitur circuli dicti quadrans eſt arcus 90. partium.

IX. Arcus quadrante minoris complementum eſt, quod ipſi ad 90. partes deeſt. *Vt, arcus BD. 40. partium, complementum eſt arcus BE. 50. partium: & viciſſim.*

X. Ar-

X. Arcus quadrante maioris excessus supra quadrantem est, quod ipsi supra 90. partes adest. *Vt, arcus GEB. 140. partium, excessus supra quadrantem est arcus EB. 50. partium.*

XI. Semicirculus est arcus 180. partium.

XII. Arcus semicirculo minoris complementum est, quod ipsi ad 180. partes deest. *Vt, arcus GEB. 140. partium, complementum est, arcus BD. 40. partium.*

XIII. Anguli per crucem oppositi sunt æquales. *Vt, anguli BAD & GAH sunt æquales. Similiter etiam anguli GAB & HAD. sunt æquales. Idem fit in Sphæricis. Veritas theorematis per se patet. Demonstratur tamen apud Euclidem de lineis rectis sese mutuo secantibus ad 15. p 1.*

XIV. Angulus est rectus vel obliquus.

XV. Angulus rectus est, cuius mensura est quadrans. *Vt, EAD.*

XVI. Angulus obliquus est obtusus vel acutus.

XVII. Angulus obtusus est, cuius mensura est arcus quadrante maior. *Vt BAG.*

XVIII. Angulus acutus est, cuius mensura est arcus quadrante minor. *Vt BAD.*

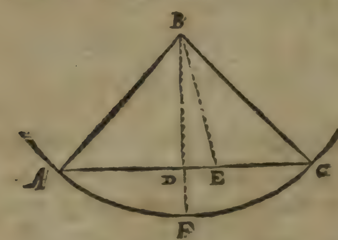
XIX. Angulorum complementa dicuntur, vt arcuum.

XX. Anguli quilibet super eadem linea vtrinq; protensa concurrentes simul sumti sunt æquales duobus rectis. *Vt, anguli BAD, EAB. & EAG concurrentes ad punctum A, super linea GD, sunt æquales duobus rectis GAE. & EAD. per structuram.*

XXI. Itaque si obliqui duo super eadem linea vtrinque protensa concurrant, alter est alterius ad duos rectos complementum. *Vt anguli GAB. complementum ad duos rectos est angulus BAD, & is huius vicissim.*

XXII. Triangulum primò est laterum quorundam æqualium vel omnium inæqualium.

XXIII. Si Triangulum ſit laterum quorundam æqualium, perpendicularis à concurſu laterum æqualium, biſecat baſin & angulum baſi oppoſitum: *Et contra. Vt, In Triangulo laterum æqualium A B & B C. perpendicularis BD biſecat baſin AC: & angulum baſi oppoſitum ABC. Biſecat baſin AC: quia ſi non biſecaret, ſed caderet extra medium punctum D. verbi gratia, in E, non eſſet perpendicularis: quippe non breuiſſima inter punctum B & rectam AC. Biſecat etiam angulum baſi oppoſitum ABC & eius menſuram AFC. quia anguli ſunt vt latera, per 5. huius.*



XXIV. Triangulum laterum quorundam æqualium eſt æquicrurum vel æquilaterum.

XXV. Triangulum æquicrurum eſt, quod duo tantùm habet latera æqualia.

XXVI. Triangulum æquicrurum eſt ad baſin æquiangulum, & contra: *per 5. huius.*

XXVII. Triangulum æquilaterum (*per excellentiam ita dictum*) eſt, quod omnia latera habet inuicem æqualia.

XXVIII. Triangulum æquilaterum eſt æquiangulum, & contra: *per 5. huius.*

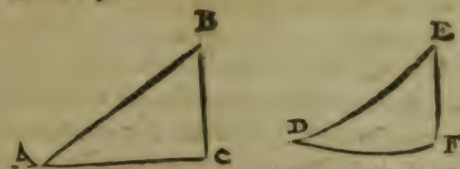
XXIX. Triangulum deinde eſt rectangulum vel obliquangulum.

XXX. Triangulum rectangulum eſt, quod vel vnum habet rectum.

XXXI. In Triangulis, rectangulis, vnum tantum rectum habentibus, ſubtendens rectum ſpeciatim hypotenuſa dicitur: includentia verò rectum, perpendiculum & baſis: pro libitu, *Vt, in triangulis ABC, & DEF, latera AB & DE ſunt hypotenuſæ:*

BC &

BC & EF. perpendicula: AC & DF bases: vel contra, AC & DF per-pendicula: BC & EF bases.



XXXII. Triangulum obliquangulum eſt, quod omnes angulos habet obliquos.

XXXIII. Triangulum obliquangulum, eſt vel obtuſangulum vel acutangulum.

XXXIV. Triangulum obtuſangulum eſt, quod vel vnum habet obtuſum.

XXXV. Triangulum acutangulum eſt, quod omnes angulos habet acutos.

XXXVI. Triangulum deniq; eſt planum, vel ſphæricum: planum, in plano: ſphæricum, in globo.

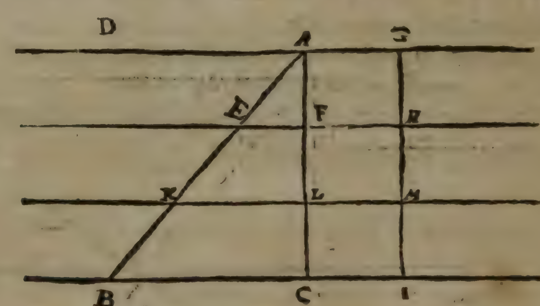
XXXVII. Trianguli plani ſub Trigonometriam cadentis latera ſunt tantum lineæ rectæ.

De lineis rectis ad Trigonometriam rectè intelligendam prænoſſe oportet ea, quæ ſequuntur theoremata.

XXXVIII. Si linea recta in rectas parallelas incidat, angulos ſimiles ſimiliterq; aut alternatim ſitos facit æquales: *& contra.*

Vt, si recta AB incidat in parallelas CD & EF: angulos similes similiterque sitos BHD & BGF, item alternatim sitos CHG & HGF, &c. facit æquales. Et contra: Si recta AB in rectas CD & EF incidens, prædictos angulos similes similiterque aut alternatim sitos, hoc est, acutos acutis, & obtusos obtusis facit æquales, rectæ CD & EF sunt parallelæ. Est 29. primi Euclidis. Lucem habet naturalem. Nam, si AB recta est, rectæ CD & EF æqualiter inter se distare non possunt, nisi ad rectam AB æqualibus angulis inclinentur. Hinc, si plures rectæ in eandem rectam sint perpendiculares, sunt inuicem parallelæ. *Vt rectæ CD & EF, sunt inuicem parallelæ, quia sunt in eandem rectam DF perpendiculares.*

XXXIX. Si plures rectæ pluribus rectis parallelis intersecentur, intersegmenta sunt proportionalia. *Verbi gratia, si duæ rectæ AB & AC intersecentur parallelis DG, EH & BI. dico intersegmenta AE & AF similiterque EB & FC esse inter sese proportionalia, hoc est, Si AE sit tertia pars rectæ AB: etiam AF fore tertiam partem rectæ AC, &c. Ratio est: quia recta EH de toto*

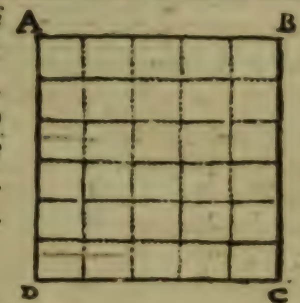


spatio DGIB abscindit partem tertiam. Ergo etiam de singulis lineis per totum istud spatium ductis.

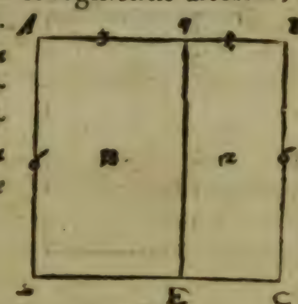
Hinc parallelæ parallelis terminatæ sunt æquales, & contra: *vt parallelæ AF & GH terminatæ parallelis AG & FH sunt æquales.*

æquales. Cum enim tota AC & GI ſint æquales: etiam partes tertiæ AF & GH æquales eſſe neceſſe eſt.

XL. Si duæ rectæ in ſe mutuo ducantur, efficitur inde quadrangulum rectangulum: *Vt, ſi duæ rectæ AB & AD in ſe mutuo ducantur, efficitur inde quadrangulum ABCD. Quod ſi ergo AB ſit quinque pedum, AD ſex: totum quadrangulum ABCD erit triginta pedum quadratorum, vt apparet ex lineis in diagrammate punctatis.*

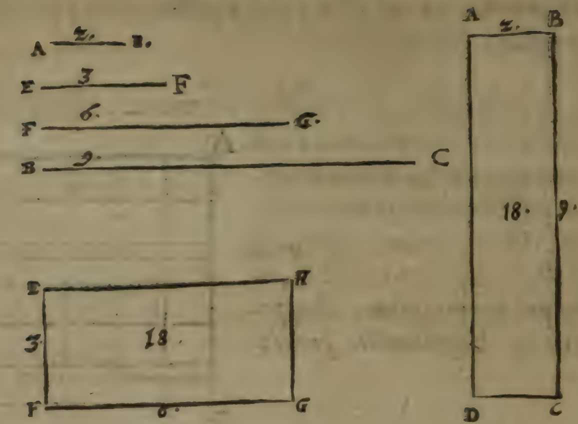


XLI. Rectangula è tota vna & ſegmentis alterius, ſimul ſumta, ſunt æqualia rectangulo ex vtraque tota. *Vt rectangula ex tota AD 6. & ſegmentis AG 3. & GB 2. nempe rectangula AGFD 18. & FGBC 12. ſimul ſumta ſunt æqualia rectangulo ABCD 30. facto ex vtraque tota AD 6. & AB 5.*



XLII. Si quatuor rectæ ſint proportionales (*hoc eſt, ſi ſe habeant, vt prima ad ſecundam, ita tertia ad quartam*) rectangulum mediarum æquatur rectangulo extremarum. *Vt, ſi ſint quatuor proportionales AB duorum: EF trium: FG ſex: BC novem pedum: Rectangulum mediarum EF & FG, nempe rectangulum EFGH, æquatur rectangulo extremarum AB & BC, nempe rectangulo ABCD. Nam vt bis novem ſunt octodecim: ita ter ſex ſunt octodecim.*

I. Si



Hinc

I. Si quatuor rectæ ſint proportionales, datis tribus, datur quarta. Rectangulum enim mediarum diuiſum per extremarum alteram, relinquit alteram: *Vt, ſi dicatur.*

Vt 2. *ad* 3. *ita* 6. *ad* 9.

Rectangulum factum ex 3. & 6. nempe 18. diuiſum per extremam primam, 2. relinquit extremam vltimam, 9. &c. Atq; hæc eſt ratio, cur in regula proportionum, quam barbarè vocant Regulam Detri, duo poſteriores termini inter ſeſe multiplicentur, & productum diuidatur per primum: quia videlicet productum multiplicationis ſecundi & tertii termini, eſt etiam productum multiplicationis primi & quarti: diuiſum itaq; per primum, relinquit quartum. Nam diuiſio & multiplicatio mutuò ſeſe produnt. Nihil autem intereſt ad praxin, vtrum terminorum mediorum ſecundo vel tertio loco ponas. Siue enim dicas.

Vt 2. *ad* 3. *ita* 6. *ad------&c. Siue*
Vt 2. *ad* 6. *ita* 3. *ad------&c.*

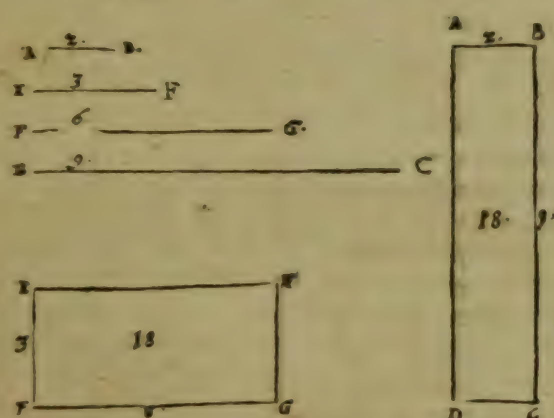
Etſi

Etsi alia in priore, alia in posteriore collocatione termini primi ad secundum, & tertii ad quartum est proportio: quæsitum tamen ex utraq; collocatione reperies prorsus idem: quia perinde est, sive tria per sex, sive sex per tria multiplices: &c.

Hinc etiam

II. Rectangula æqualia latera habent reciprocè proportionalia: (*hoc est, In rectangulis æqualibus habent sese, ut latus minus rectanguli primi ad latus minus secundi, ita latus maius rectanguli secundi ad latus maius primi*) & contra. *Verbi gratia, in rectangulis æqualibus ABCD & EFGH habent sese:*

Vt	AB	*ad*	EF	*ita*	FG	*ad*	BC, *&c.*
	2		3		6		9

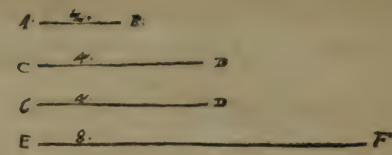


Causa est manifesta ex antecedentibus.

XLIII. Si tres rectæ sint proportionales: (*hoc est, si se habeant, ut prima ad secundam, ita secunda ad tertiam*) quadratum mediæ, æquatur oblongo extremarum:

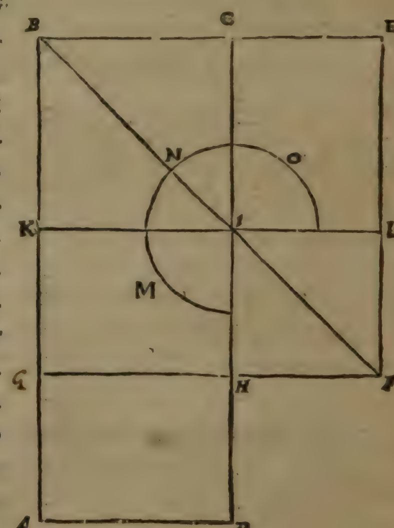
Quia enim media bis ponitur, hoc modo:

Vt
ad
ita
ad



Perinde eſt, ac ſi eſſent quatuor proportionales. Ideo quicquid de quatuor proportionalibus dictum fuit, de tribus quoq; proportionalibus eſt intelligendum.

XLIV. Si recta biſecta continuetur, oblongum continuatæ & continuationis eſt æquale quadrato rectæ ex biſegmento & continuatione compoſitæ: minus quadrato biſegmenti, *6.p.2 Euclid.*

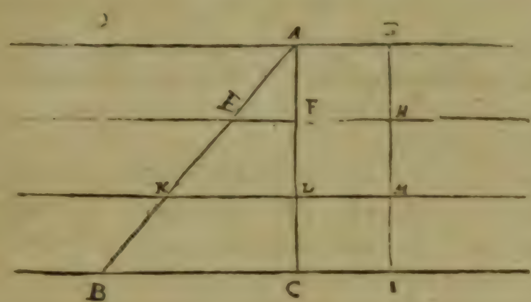


Eſto recta AK biſecta in G & continuata in B: continuationi KB ſtatuatur æqualis BC, atq; inde fiat oblongum ABCD. Ad rectam porro GB compoſitam ex biſegmento GK & continuatione KB deſcribatur quadratum GBEF: & ex eo quadrato per rectas KL & GH abſcindatur quadratum biſegmenti ILFH, ut relinquatur gnomon MNO. Dico oblongum ABCD eſſe æquale quadrato GBEF minus quadrato ILFH ſive, quod idem eſt, dico oblongum ABCD eſſe æquale gnomoni MNO. Spacia enim M & N ſunt communia. Spacium verò gnomonis O, ſive rectangulum

lum ICEL, est æquale rectangulo GHDA. Vtrumq; enim factum est ex continuatione & bisegmento. Ergo si recta bisecta continuetur, &c. quod demonstrandum erat.

Atq; hæc de lineis rectis, tanquam de lateribus triangulorum planorum, huc inserenda duximus. Nunc ad ipsa triangula plana revertemur.

XLV. In triangulo plano parallela basi crura secat proportionaliter.

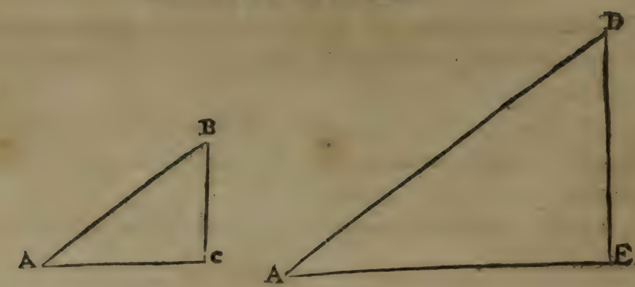


Vt, in triangulo plano ABC. si KL. parallela basi BC. abscindat de crure AC. partem tertiam: etiam de crure AB partem tertiam abscindet, per 39. hujus: adeoq; erunt:

Vt AB ad AC, ita AK ad AL. Item:
Vt AK ad BK, ita AL ad CL. Item:
Vt AK ad AL, ita KB ad LC.

XLVI. Si plura triangula plana comparentur: TRIANGVLA ÆQVIANGVLA HABENT LATERA CIRCA ÆQVALES ANGVLOS PROPORTIONALIA: & contra, 4. *p. 6. Euclid.*

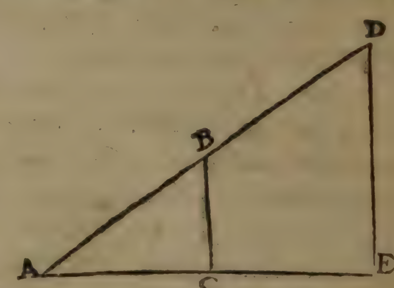
Hoc theorema præcipuum est totius Trigonometriæ fundamentum. Igitur præ cæteris cunctis diligenter & explicetur & attendatur.



DECLARATIO. Sint ergo duo triangula plana, ABC & ADE æquiangula. sic ut anguli ad B & D. Item ad A & A. Item ad C & E sibi mutuo sint æquales: Dico latera eorum esse circa æquales angulos proportionalia, hoc est, esse:

I. Vt AB ad BC, ita AD ad DE.
II. Vt AB ad AC, ita AD ad AE.
III. Vt AC ad CB, ita AE ad ED.

DEMONSTRATIO. Quia enim anguli BAC & DAE sunt æquales, ex thesi: ideo si AB ad AD applicetur, AC necessariò cadet in AE, & ex illa applicatione tale Schema existet. In quo schemate, quia latera AB & AC coincidunt, & præterea anguli ad B & D: itemq; ad C & E sunt æquales, ex thesi: Ideo latera reliqua BC & DE necessariò erunt parallela, per 38. huius. Atqui in Triangulo plano recta parallela basi crura secat pro-

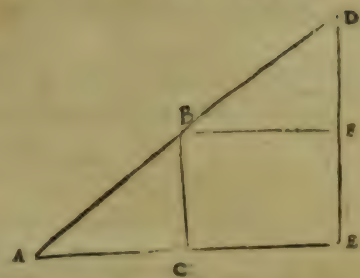


portionaliter, per proximè præcedentem. Ergo in Triangulo ADE recta BC, cum sit parallela basi DE: crura AD & AE secat proportionaliter: adeoq;

Vt,

Vt, ∠AB ad ∠AD ita ∠AC ad ∠AE.

Porrò, per punctum B ducatur recta BF parallela basi ∠AE. Hac reliquum crus DE cum crure DA secabit proportionaliter in punctis B & F per eandem proximè præcedẽtem: eritq; iam etiam:



Vt AB ad AD, ita FE ad DE.
Siue, quod idem est:
Vt AB ad AD, ita BC ad DE.

Nam FE & BC æquantur per consectarium 39. hujus. Præterea cum sint:

Vt AB ad AD, ita AC ad AE,
& ita BC, ad DE. Eruntetiam:
Vt AC ad AE, ita BC ad DE.

Nam quæ uni tertio conveniunt, etiam inter sese conveniunt. Igitur iam in universum erunt:

I. Vt ∠AB ad AD, ita BC ad DE.
II. Vt ∠AB ad AD, ita AC ad AE.
III. Vt ∠AC ad AE, ita BC ad DE.

Deniq; quia ad effectum nihil interest, utrum terminorum proportionalium intermediorum secundo, vel tertio loco colloces: Erunt etiam permutatim:

I. Vt ∠AB ad BC, ita AD ad DE.
II. Vt ∠AB ad AC ita AD ad AE.
III. Vt ∠AC ad BC, ita AE ad DE.

Atq; adeo Triangula plana æquiangula, qualia hic sunt ABC & ∠ADE latera habent circa æquales angulos proportionalia: quod demonstrandum erat.

ILLVSTRATIO per numeros: *Sit igitur ◡AB quinq; pedum: AD, decem: DE, sex. Quæritur BC quot pedum?* ℞. *Trium. Nam*

AD   *DE*   *AB.*

Vt 10--------*ad*------6- -----*ita*-------5.

30
10 (*ad* 3. *BC.*

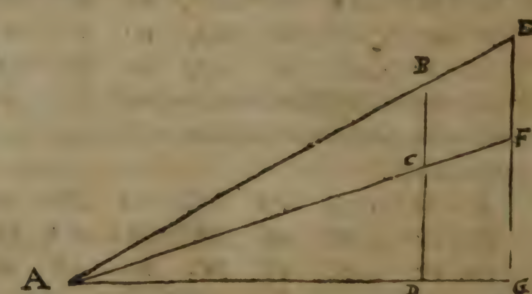
Sit AC quatuor pedum; BC, trium: DE, sex. Quæritur ◡AE, quot pedum? ℞ *Octo. Nam,*

BC   *CA*   *DE*

Vt- ----3------*ad*-------4------*ita*-------6.

24
3 (*ad* 8. ◡*AE.*

XLVII. Si plura Triangula plana componantur, & rectis parallelis intersecentur: intersegmenta sunt proportionalia: *hoc est, si (verbi gratia) Triangula duo EAF & FAG cōponantur, & rectis parallelis BCD & EFG intersecentur: intersegmenta sunt:*



Vt,

Ut BC ad EF, ita CD ad FG:
Vel:
Ut BC ad CD, ita EF ad FG: &c.

Per 39. hujus: vel per proximè præcedentem. Nam Triangula ABC & AEF sunt æquiangula per 38. hujus, propter BC & EF parallelas. Igitur,

Ut AC ad AF, ita BC ad EF:

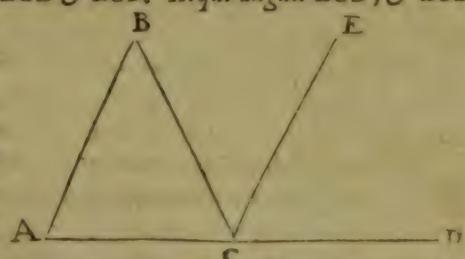
Per proximè præcedentem. Atqui per eandem:

Ut AC ad AF, ita CD ad FG.

Quæ verò conveniunt uni tertio, etiam inter se conveniunt. Ergo sunt etiam

Ut BC ad EF, ita CD ad FG. &c.

XLVIII. Si Trianguli plani quodcunq; latus continuetur, angulus exterior per continuationem illam factus, est æqualis angulis duobus interioribus oppositis: *Ut, si Trianguli plani ABC latus AC continuetur in D: angulus BCD exterior, erit æqualis duobus interioribus oppositis BAC & ABC. Si enim ex puncto C suscitetur recta CE parallela rectæ AB: angulus exterior BCD erit compositus ex angulis ECD & ECB. Atqui anguli ECD, & ECB sunt æquales duobus interioribus oppositis BAC & ABC (nempe angulus ECD angulo BAC, & angulus BCE angulo ABC) per 38. hujus: propter parallelas AB & CE. Ergo etiam angulus*



BCD est æqualis duobus interioribus oppositis BAC & ABC: quod demonstrandum erat.

XLIX. In Triangulo plano tres anguli sunt duobus rectis æquales: *Ut in Triangulo plano ABC, Schematis antecedentis: dico*

dico tres angulos ABC, BAC & ACB esse æquales duobus rectis. Anguli enim quilibet super eadem recta ad idem punctum concurrentes, sunt æquales duobus rectis, per 20. hujus. Atqui anguli tres ABC BCA & BAC æquipollent angulis tribus super eadem recta AD ad idem punctum C concurrentibus. Angulus enim BCA est communis: anguli verò ECD & ECB angulis BAC & ABC sunt æquales, per proximè præcedentem. Ergo anguli tres ABC, BCA & BAC sunt æquales duobus rectis. Quod demonstrandum erat. Hinc:

1. In Triangulo plano non potest esse nisi unus rectus vel obtusus.

2. Et uno existente recto vel obtuso, cæteri duo necessariò sunt acuti.

3. Et, duorum quorumcunque tertius est ad duos rectos complementum.

4. Hinc deniq; : Si duo Triangula binis angulis sint æquiangula, prorsus sunt æquiangula.

L. In Triangulo plano rectangulo, latera includentia rectum æquè possunt hypotenusæ, *penult. primi Euclid.*

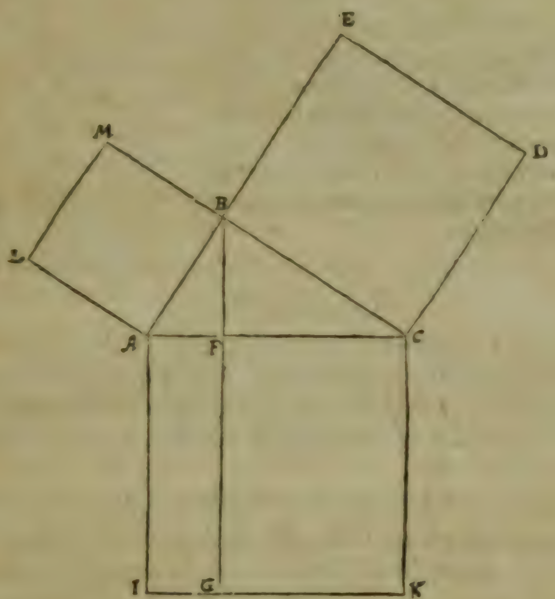
DECLARATIO. In Triangulo plano ABC rectangulo ad B. dico latera AB & BC includentia rectum ABC. æquè posse hypotenusæ AC. hoc est, quadrata laterum AB & BC, nempe quadrata ALMB & BEDC simul sumta, esse æqualia quadrato hypotenusæ, AC. nempe quadrato ACKI.

DEMONSTRATIO. Si enim ex recto B descendat perpendicularis BFG ex quadrato ACKI fiunt oblonga duo AFGI & FCKG. quæ sunt æqualia, hoc quidem quadrato BEDC: illud autem quadrato ALMB. Ergo & quadratum ACKI. ex duobus illis oblongis compositum, est æquale duobus quadratis, ALMB & BECD. Quod autem duo oblonga AFGI & FCKG. duobus quadratis ALMB & BEDC sint æqualia, id de singulis in specie: ac primum quidem de oblongo AFGI sic probatur.

Si tres rectæ sint proportionales, quadratum mediæ æquatur oblongo extremarum, per 43. hujus.

Atqui

Atqui tres recta, AI, AB & AF, sunt proportionales, hoc est, habent sese, ut AI ad AB, ita AB ad AF.



Ergo quadratum ex AB, aequatur oblongo ex AI & AF.

Minor probatur. Triangula enim ABC & BAF sunt aequiangula, propter communem ad A & rectos ad B & F. per 4 c. 49. hujus. Ergo per 46. hujus, ut AC, (cui aequalis est AI.) ad AB. ita AB ad AF.

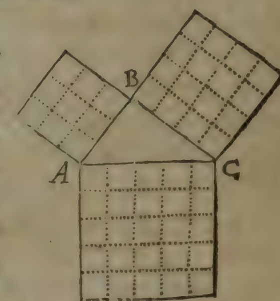
Simili prorsus modo probatur, oblongum FCKG esse aequale quadrato BEDC. Triangula enim ABC & BCF sunt aequiangula, propter cōmunem ad C & rectos ad B & F. per 4. c. 49 hujus. Ergo per 46. hujus, Vt AC ad BC: ita BC ad FC. adeoq; per 43. hujus, quadratum ex BC est aequale oblongo ex AC sive KC & FC.

C In

In triangulo igitur plano rectangulo latera includentia rectum æquè possunt hypotenusæ. Quod demonstrandum erat.

Scholion.

Crassiore minerva hæc propositio sic demonstrari potest. Sit triangulum ABC rectangulum ad B, & sint latera AB.3.BC.4.AC.5.pedum. Quadrentur singula latera; & quadrata singula lineis punctatis in pedes quadratos distinguãtur. Videbis quadratum hypotenusæ AC. habere tot pedes quadratos, quot pedes quadratos habent quadrata laterum AB & BC. simul sumta.



Consectarium.

Igitur in Triangulo plano rectangulo, datis duobus quibuscunq; lateribus, datur tertium. *Vt si dentur duo latera includentia rectam AB & BC partium 3. & 4 iunctis eorum quadratis 9 & 16. in unam summam 25. & radice inde extracta, reperitur hypotenusa AC partium 5.*

Contra, si detur hypotenusa partium quinq; & alterum includentium rectum, partium trium: subtracto quadrato trium partium de quadrato quinq; partium, hoc est, subtracto quadrato 9. de quadrato 25. & ex residuo 16. extracta radice quadrata, reperietur alterum includentiũ rectum, partium 4.

Scholia de extractione radicis quadratæ.

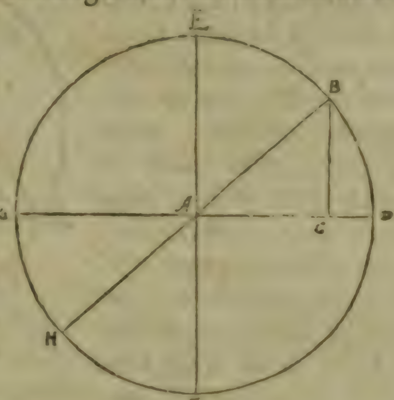
I. *Si post extractam radicem quadratam ex aliquo numero fractiones aliquæ superfuerint, radicem duplicatam & insuper unitate auctam, fractionibus illis subnotabis: hoc modo.*

$$\overset{3}{\cancel{1}\cancel{2}} \,(\, 3\tfrac{3}{7}$$

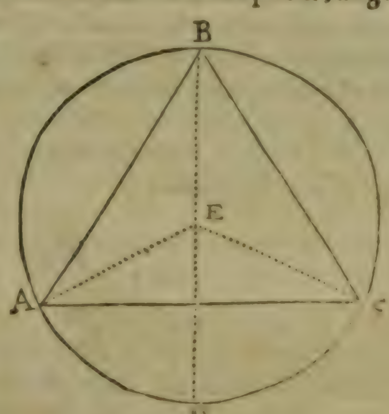
II. *Radix quæ huiusmodi fractiones adiunctas habet, nunquam est exactè vera. Nam radix exactè vera in se ipsam ducta, numerum, unde extracta est, ad assem reddere debet. Atqui si radicem $3\frac{3}{7}$ in seipsam ducas, hoc est si $3\frac{3}{7}$ per $3\frac{3}{7}$ multiplices, non procreabis inde numerum 12. unde radix $3\frac{3}{7}$ est extracta. sed tantum $11\frac{37}{49}$. Qua de re vide Ramum in elementis Geometricis, elemento octauo libri XII. Et Lazarũ Schönerum in scholiis & tractatibus ad arithmeticam Rami adiunctis.*

LI. In Triangulo plano rectangulo, latera includentia rectum ad hypotenusam plerunq; sunt irrationalia, hoc est, numero exacto datæ mensuræ cujuscunq; inexplicabilia. *Causa patet ex Scholio secundo proximè præcedentis.*

LII. In Triangulo plano rectangulo, acutorum alter est alterius complementum. *Per 49. hujus. Facilime etiam probatur hoc modo. In Triangulo plano ABC, rectangulo ad C, angulus ABC acutorum alter, est æqualis angulo BAE per 8. huius: propter parallelas EA & BC. Atqui angulus EAB est complementum anguli BAC per structuram. Ergo etiam angulus ABC est complementum anguli BAC.*

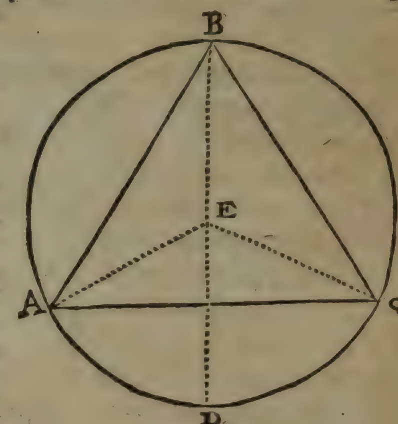


LIII. Si Triangulum planum circulo sit inscriptum, anguli ad circumferentias oppositas sunt subdupli: *Vt, si in circulo ABC circumferentia BC sit 120 graduum. Angulus BAC circumferentiæ BC oppositus erit 60. graduũ. Ratio est.*



Quia circumferentia tota ABC est 360. graduum, per 7. hujus. Anguli vero tres trianguli ABC circulo inscripti sunt 180 graduũ, per 49. hujus. Ergo ut circumferentia quæq; est tertia pars de 360. Ita angulus quilibet circumferentiæ illi oppositus est tertia pars de 180.

Evidentius ita demonstratur, v.g. de angulo ABC. Ex angulo dicto ∠ABC ducatur per totum circuli planum diameter BED. Ex centro verò E ad circumferentiā ABCD ducantur duo radii EA & EC. Dico angulos partiales ∠ABD & DBC esse subduplos ad angulos partiales AED & DEC. Nam anguli ∠ABE & BAE æquantur per 5. hujus. ∠Angulus verò ∠AED æqualis est angulis ABE & BAE simul sumtis, per 48. hujus. Ergo angulus AED ad angulum ABD est duplus. Similiter, ∠Anguli EBC & ECB sunt æquales per 5. hujus. Et his utrisq; simul



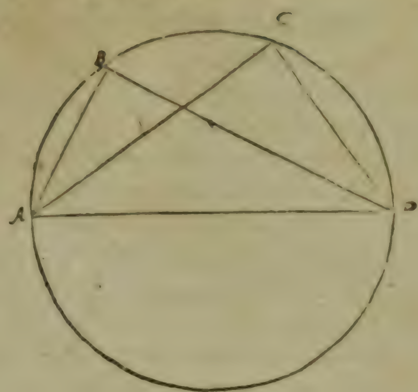
est æqualis angulus DEC per 48. hujus. Ergo etiam angulus DEC ad angulum DBC est duplus. Quia igitur partes anguli ∠AEC ad partes anguli ABC sunt duplæ: ideo etiam totus AEC ad totum ABC est duplus: ac proinde angulus ABC ad angulum AEC, & per consequens etiam ad arcum ∠ADC tanquam ad mensuram anguli ∠AEC est subduplus. Idem judicium est de cæteris. Si ergo Triangulum planum circulo sit inscriptum, anguli ad circumferentias oppositas sunt subdupli: quod demonstrandum erat.

Hinc

I. Si latus Trianguli plani circulo inscripti sit diameter, angulus illi oppositus est rectus: *hoc est, 90. graduum: quippe oppositus semicirculo, qui est 180. graduum.*

II. Si plura Triangula plana eidem circuli segmento ad eandem basin inscribantur, sunt in fastigiis æquiangula. *Vt Trian-*

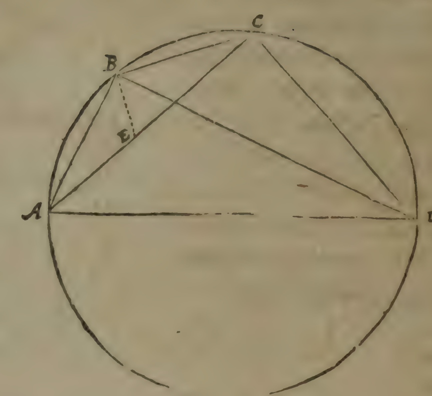
Triangula duo ABD & ACD inscripta eidem circuli segmento ABCD ad eandem basin AD, sunt in fastigiis B & C æquiangula. Vtrique enim angulo, nempe, tàm angulo ACD, quàm angulo ABD, opponitur eadem circumferentia AD.



LIV. Si duo Triangula plana eidem circuli segmento ad eandem basin inscripta, supernè connectantur: sic vt inde existat figura quadrilatera, diagoniis intersecta: Rectangulum diagoniorum est æquale rectangulis oppositorum laterum simul sumtis. *Ptolomæus, Copernicus.*

DECLARATIO. Sint duo triangula ABD & ACD eidem circuli segmento ABCD super eandem basin AD inscripta, & supernè per rectam BC connexa: ut existat inde figura quadrilatera ABCD. Dico rectangulum diagoniorum AC & BD æquale esse rectangulis oppositorum laterum AB & CD. Item BC & AD simul sumtis.

DEMONSTRATIO. Si enim ad punctum B constituas angulum ABE æqualem angulo DBC: & ita diagonium AC per rectam BE seces in duas partes ad punctum E: manifestum fiet, rectangula BD & EC. Item BD & AE esse æqualia rectangulis BC & AD. Item CD & AB. Nam, si quatuor rectæ sint proportionales, rectangulum mediarum æquatur rectangulo extremarum, per 42. hujus.



Atqui quatuor rectæ BD, DA, BC & CE sunt proportionales. Nam, quia Triangula ABD & BCE, sunt æquiangula propter æquales BCA & BDA per c. 2. præcedentis. Item propter æquales ABD & EBC (qui sunt æquales propter eundem EBD additum ad æquales ABE & DBC) & deniq; propter æquales BEC & BAD per c. 4. 49. hujus. Ideo latera eorum sunt, Vt, BD ad DA, ita BC ad CE. Similiter quatuor rectæ BD, DC, BA, & AE sunt proportionales.

Nam, quia Triangula BDC & BAE sunt æquiangula, propter æquales BDC & BAE, per c. 2. præcedentis: Item propter æquales DBC & ABE ex thesi: & denique propter æquales BCD & BEA per c. 4 p. 49 hujus. Ideo latera eorum sunt, Vt BD ad DA, ita BA ad AE.

Ergo rectangulum rectarum DA & BC æquatur rectangulo rectarum BD & CE. Similiterque rectangulum rectarum DC & BA æquatur rectangulo rectarum BD & AE. Et contra, Rectangula BD & CE, Item BD & AE æquatur rectangulis DA & BC, item DC & BA.

Atqui, rectangula BD & CE: Item BD & AE sunt rectangulum BD & AC per 41. hujus.

Ergo Rectangulum diagoniorum BD & AC est æquale rectangulis laterum binorum oppositorum DA & BC: Item DC & BA simul sumtis: quod demonstrandum erat.

Consectarium.

Igitur in figura quadrilatera, circulo inscripta, & diagoniis inter-

interſecta, atq; adeo ſex lineis rectis conſtante: datis quinque quibuſcunque, datur ſexta.

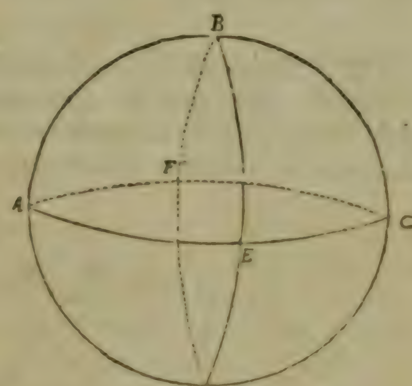
Exempla illuſtriſſima habebis libro ſecundo, prop. 32, 33, 35. & 36.

Hactenus de Triangulis planis: ſequitur de ſphæricis.

LV. Trianguli ſphærici latera ſunt arcus circulorum maximorum ſigillatim ſemicirculo minores.

LVI. Circulus ſphæræ maximus eſt, qui totam ſphæram in duo hemiſphæria dividit: adeoque à polis ſuis vndiq; per quadrantem circuli itidem maximi diſtat.

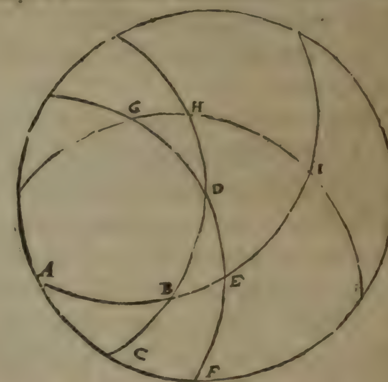
LVII. Si maximus ſphæræ circulus per maximi polos tranſeat, rectè eum ſecat; & contra.



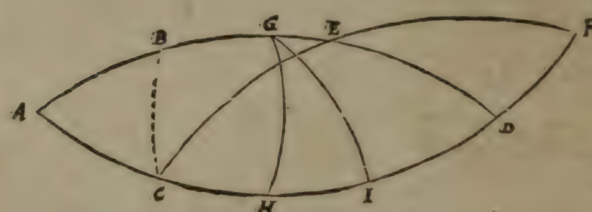
Sit maximus ſphæræ circulus ◡ AEC, eiusq; poli B & D, per quos polos B & D tranſeat alius circulus maximus BED. Dico, quod maximus BED maximum ◡ AEC rectè ſecet ad E & F. Polo enim E vel F deſcribatur circulus itidem maximus ABCD: manifeſtum eſt hujus arcus ◡ AB, BC, CD, DA, fore menſuras angulorum ad E & F, per 6. hujus. Atqui arcus ◡ AB, BC, CD, DA, ſunt quadrantes, per proximè præcedentem. Ergo anguli ad E & F ſunt recti, per 15. hujus. Quod demonſtrandum erat.

LVIII. Menſura anguli ſphærici, ſi in circulo maximo accipiatur, eſt arcus circuli maximi ex angulari puncto deſcri-

deſcripti, inter crura quadrante tenus continuata interceptus: *per 7. & 56. hujus. Vt, anguli ſphærici BAC menſura non eſt arcus BC, ſed arcus EF inter crura AB & AC quadrantetenus, nempe vſque ad E & F continuata interceptus. Quia non arcus BC, ſed arcus EF eſt ex angulari puncto A deſcriptus, per 56. hujus. Ergo arcus BC anguli BAC menſura eſſe non poteſt, per 7. hujus.*



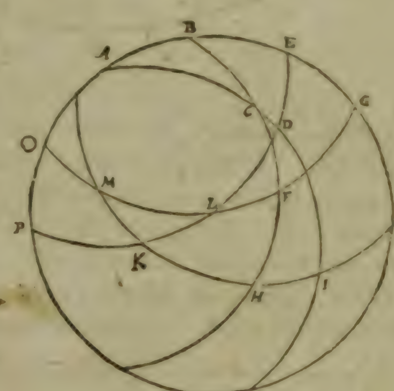
LIX. Si anguli ſphærici crura continuata concurrant, ſemicirculos efficiunt, & comprehendunt angulum angulo prædicto & oppoſito æqualem: *Vt, Anguli BAC crura AB & AC continuata in D efficiunt ſemicirculos ABD & ACD, & comprehendunt angulum BDC angulo BAC æqualem: quia idem arcus GH utrumq; illum angulum metitur, per proximè præcedentem.*



LX. Triangulum ſphæricum quodlibet ex quovis angulari puncto, habet oppoſitum ſibi Triangulum aliud, cujus baſis

baſis eſt eadem, & angulus baſi oppoſitus: reliquæ partes ſunt partium prioris Trianguli complementa. *Vt, Triangulum BAC ex puncto angulari ◡A, habet oppoſitum ſibi Triangulum BDC, cuius eadem eſt baſis BC, & angulus baſi oppoſitus BDC per proximè antecedentem. Latera vero BD & CD ſunt laterum ◡AB & ◡AC complementa ad ſemicirculum per eandem. ◡Anguli denique DBC & DCB ſunt angulorum ◡ABC & BCA ad duos rectos complementa, per 21. hujus*

LXI. Trianguli ſphærici latera in angulos, & contra, permutari poſſunt: complementis ad ſemicirculum pro latere & angulo maximo hinc inde ſumtis. *Sit Triangulum ſphæricum ABC obtuſangulum ad B. Anguli ◡A menſura ſit DE. ◡Anguli B acuti (qui complementum eſt B obtuſi, & in dato Triangulo maximi) menſura ſit FG. ◡Anguli C menſura ſit HI. ◡Arcui DE æquatur KL: quia KD & LE ſunt quadrantes, & commune eorum complementum eſt LD. Arcui FG æquatur LM: quia LG & FM ſunt quadrantes, & commune eorum complementum eſt LF. Arcui HI æquatur KM: quia KI & ◡MH ſunt quadrantes, & commune eorum complementum eſt KH. Ergo angulis Trianguli ABC æquantur latera Trianguli KLM: pro angulo maximo ABC: eius complemento FBG aſſumto. Pari ratione*

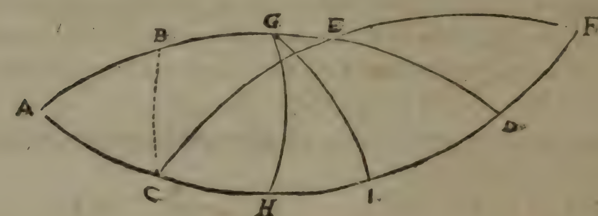


demonſtrari poteſt, Trianguli ◡ABC latera eſſe æqualia angulis Trianguli KLM. Latus enim AC æquatur arcui DI menſuræ anguli DKI cõplementi obtuſi MKL. Latus AB æquatur arcui OP menſuræ anguli MLK. Latus denique BC æquatur arcui FH menſuræ anguli LMK.

Sunt enim quadrantes ◡AD & CI, ◡AP & OB, BF & CH. Et communia binorum complementa CD, ◡AO, CF. Trianguli igitur ſphærici latera in angulos, &c. permutari poſſunt, quod demonſtrandum erat.

LXII. Triangulum ſphæricum rectangulum aut unum habet rectum, aut plures uno.

LXIII. Unum rectum, vel cum duobus acutis, Ut, BAC: vel cum duobus obtuſis, Ut, BDC: vel cum obtuſo & acuto, Ut CDE.



◡Angulos enim ad ◡A & D nunc fingimus eſſe rectos.

LXIV. Triangulum ſphæricum rectangulum cum duobus acutis habet ex angulo recto oppoſitum ſibi Triangulum rectangulum cum duobus obtuſis: & contra: *Vt videre eſt in Triangulis rectangulis BAC & BDC.*

LXV. Trianguli ſphærici rectanguli cum duobus acutis latera ſingula ſunt quadrantibus minora, *Vt in ◡ABC.*

LXVI. Trianguli ſphærici rectanguli cum duobus obtuſis latera duo ſunt quadrantibus majora: tertium quadrante minus, *Vt in BDC.*

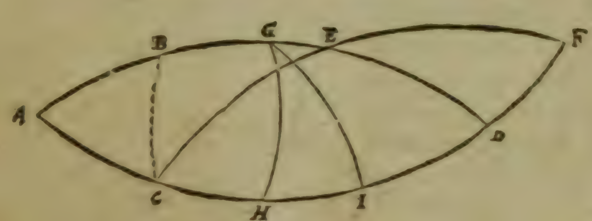
LXVII. Triangulo ſphærico rectangulo cum acuto & obtuſo opponitur ex acuto Triangulum rectangulum cum duobus acutis, *Vt Triangulo rectangulo CDE, cum acuto ECD, & obtuſo*

obtuso CED, opponitur Triangulum rectangulum EDF, cum duobus acutis ad E & F.

LXVIII. Trianguli sphærici plures rectos habentis, latera rectos subtendentia, sunt quadrantes. *Causa est: quia v. g. in Triangulo ◡AGH, si circuli maximi ◡AG & ◡AH, secent maximum GH, angulis ad G & H rectis, ◡A est polus maximi GH, per 57. hujus. ◡AG vero & ◡AH sunt quadrantes, per 56. hujus. Quod si ergo angulus ad ◡A etiam sit rectus, etiam GH, est quadrans, per 58. & 15. hujus.*

LXIX. Triangulum sphæricum plures rectos habens habet tres vel duos rectos: adeoque de lateribus, tres vel duos quadrantes. *Vt si angulum ad ◡A ponas rectum, Triangulum sphæricum AGH, habebit tres rectos angulos ad A, G & H. & idcirco etiam tria latera, AG, GH, AH quadrantes. Sin eundem ad A ponas acutum, Triangulum sphæricum AGH, habebit duos rectos, ad G & H, & idcirco etiam duo latera AG & AH, quadrantes.*

LXX. Si trianguli sphærici duos rectos habentis tertius angulus sit acutus, tertium latus est quadrante minus: sin obtusus, majus. *Vt in Triangulo sphærico HGI, acutangulo ad G, tertium latus HI, est quadrante minus. In Triangulo sphærico AGI, obtusangulo ad G, tertium latus AI, est quadrante majus.*



LXXI. Triangulum sphæricum obliquangulum aut constat ex puris acutis vel obtusis: aut ex his utrisq; mixtis.

LXXII. Triangulo ſphærico purè acutangulo opponitur Triangulum ſphæricum cum duobus obtuſis & vno acuto: & contra. *Vt, ſi anguli ad A & D fingantur acuti, Triangulo ABC purè acutangulo opponitur Triangulum BDC cum duobus obtuſis ad B & C, & uno acuto ad D.*

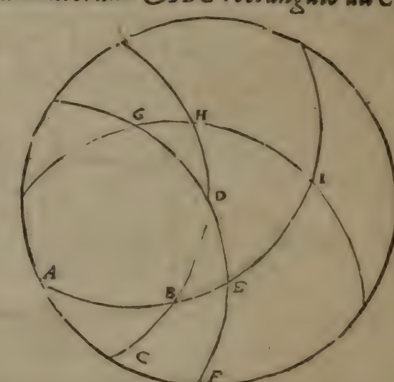
LXXIII. Triangulo ſphærico purè obtuſangulo opponitur Triangulum ſphæricum cum duobus acutis & uno obtuſo: & contra. *Vt, ſi anguli ad ◡A & D fingantur obtuſi, Triangulo purè obtuſangulo BDC opponitur Triangulum ◡ABC cum duobus acutis ad B & C, & non obtuſo ad ◡A.*

LXXIV. Trianguli ſphærici cuiuſcunq; tres anguli ſunt duobus rectis maiores.

De Triangulis ſphæricis plures uno rectos vel obtuſos, ſive ſolos ſive mixtos, habentibus, res per ſe eſt manifeſta.

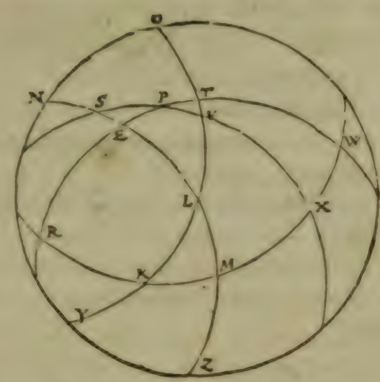
De Triangulis ſphæricis duorum vel trium acutorum, ita demonſtrari poteſt.

In Triangulo ſphærico duorum acutorum ◡ABC rectangulo ad C, acutangulo ad A & B, menſura acuti BAC eſt arcus EF: menſura verò acuti ABC vel DBE non eſt arcus DE ſed HI per 58. hujus. Atqui arcus EF & DE quadrantẽ complent. Ergo arcus EF & HI. coniunctim quadrante ſunt maiores. Et per conſequens etiã anguli his arcubus reſpondentes, nempe, anguli BAC & ABC. coniunctim quadrante, hoc eſt, angulo recto ſunt maiores.



◡ACB verò eſt rectus, ex theſi. Ergo in Triangulo ſphærico duorum acutorum ◡ACB tres ſunt anguli duobus rectis maiores.

In Triangulo sphar. mere acutangulo KLM mensura acuti ad L est arcus NO: mensura acuti ad K est arcus VX, mensura acuti ad M est arcus QR. Atqui hi tres arcus, NO, VX, & QR. simul sumti duobus quadrantibus sunt maiores. Duorum enim arcuum QR & VX complementa PV & PQ simul sumta sunt minora, quàm arcus NO per structuram. Ergo arcus NO mensura tertii anguli est maior quam complementa reliquorum duorum angulorum simul sumta. Et per consequens etiam angulus tertius est maior, quàm pro reliquorum duorum complementis.



Adeoque etiam in Triangulis sphaericis mere acutangulis, tres sunt duobus rectis maiores. Subtiliorem demonstrationem vide apud Regiomon. 40. p. 3.

BARTHOLOMÆI
Pitisci Grunbergensis

TRIGONOMETRIÆ
LIBER SECVNDVS.

De necessariis ad dimensionem Triangulorum, tabulis Sinuum, Tangentium & Secantium.

I. Triangula sic sunt. Dimensio Triangulorum est ignotorum in Triangulis sive laterum, sive angulorum, ex notis tribus, sive lateribus, sive angulis, sive puris, sive mixtis, inventio. *Dicitur etiam solutio Triangulorum : item calculus Triangulorum.*

(Sunt in Triangulis præter angulos & latera, etiam areæ. Sed illarum dimensio neq; Triangulorum est propria. Nam & aliarum quarumcunq; figurarum areas metimur. Neq; primò Triangulis inest: sed à quadrangulis ad Triangula derivatur. Ideo huc non pertinet.)

II. Dimensio Triangulorum perficitur per auream Arithmeticæ regulam: quæ docet de quatuor numeris inter sese proportionalibus, datis tribus quibuscunque reperire quartum.

III. Ergo ad dimensionem Triangulorum & proportiones omnium Trianguli partium inter sese certas, & easdem numero explicatas esse oportet.

IV. Proportiones omnium Trianguli partium inter sese certæ esse non possunt: nisi, quicquid est in Triangulis curvilineum: (ut sunt in universis, mensuræ angulorum, & in sphæricis etiam latera) ad lineas rectas reducatur. Nam curvi neq; ad curvum, neq; ad rectum inventa est huc usq; proportio: neq; fortassis invenietur unquam.

V. Cur-

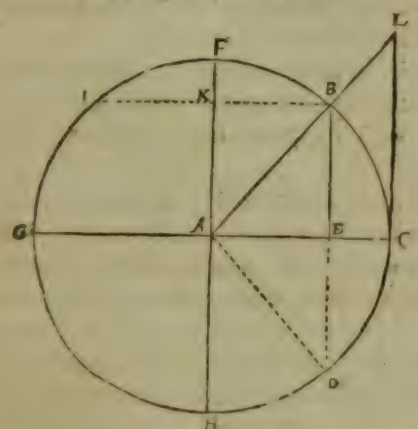
V. Curvæ lineæ ad rectas reducuntur per definitionem quantitatis, quam habeant rectæ ad circulum applicatæ, respectu radii.

VI. Rectæ ad circulum applicatæ sunt subtensæ, Sinus, Tangentes & Secantes.

VII. Subtensa est recta in circulum inscripta, totum circulum in duo segmenta dividens, & utrumq; segmentum pariter subtendens.

VIII. Subtensa est maxima, vel non maxima.

IX. Subtensa maxima est, quæ totum circulum in duo segmenta æqualia dividit: atq; adeo utrinque semicirculum subtendit. *Vt recta GC, vulgò diameter dicitur.*



X. Subtensa non maxima est, quæ totum circulum in duo segmenta inæqualia dividit: atq; adeo ab una parte arcum semicirculo minorem, ab altera arcum semicirculo majorem subtendit: *Vt recta IB, quæ ab una parte subtendit arcum semicirculo minorem IFB, ab altera parte subtendit arcum semicirculo majorem IHB.*

XI. Si-

XI Sinus eſt rectus vel verſus.

XII. Sinus rectus eſt ſemiſſis ſubtenſæ dupli arcus. *Vt, ſinus rectus arcus BC vel BG, eſt recta BE ſemiſsis ſubtenſæ dupli arcus BC vel BG, hoc eſt, ſemiſſis rectæ BED, quæ arcum BCD vel BGD ſubtendit. Sic ſinus rectus arcus BF vel BH eſt recta BK. quippe ſemiſſis rectæ BKI, quæ duplum arcum BF vel BH, nempe arcum BFI vel BHI ſubtendit.*

Conſectaria.

1. Sinus ergo rectus arcus quadrante minoris & maioris uſque ad ſemicirculum eſt idem. *Vt ſinus rectus arcus BC & BG eſt eadem recta BE: quippe ſemiſſis rectæ BED, quæ tam arcum BGD, quàm arcum BCD ſubtendit.*

2. Ac proinde ſinus rectus complementi quandocunque dicitur, intelligitur tantum ſinus complementi arcus quadrante minoris. *Vt, ſinus rectus complementi BC, nempe arcus BF eſt recta BK.*

3. Sinus rectus omnis eſt in diametrum ex altero arcus termino ductam perpendicularis. *Quia enim in Triangulo ABD laterum æqualium AB & AD, ſemidiameter AC à concurſu laterum æqualium ducta, biſecat baſin BD ad E per definitionem ſinus recti: ideo eſt in eam perpendicularis: & hæc viciſſim in illam, per 23. p. 1.*

4. Sinus rectus complementi eſt æqualis ſegmento diametri ſive radii inter ſinum rectum arcus & centrum intercepti. *Vt, ſinus rectus complementi BF, nempe recta BK eſt æqualis rectæ EA, per c. 39. p. 1.*

XIII. Sinus verſus eſt ſegmentum diametri inter ſinum rectum & circumferentiam interceptum. *Vt, ſinus verſus arcus BC eſt ſegmentum diametri EC: ſinus verſus arcus BG eſt ſegmentum diametri GE.*

XIV. Ergo ſinus verſus, alius eſt maior, alius minor.

XV. Si-

XV. Sinus verſus maior, eſt ſinus verſus arcus quadrante maioris; *Vt, GE eſt ſinus verſus arcus quadrante maioris GFB.*

XVI. Sinus verſus minor eſt ſinus verſus arcus quadrante minoris: *Vt, EC eſt ſinus verſus arcus quadrante minoris BC.*

XVII. Tangens eſt recta à ſecante per alterum arcus terminum ducta in extremitatem diametri ad alterum arcus terminum perpendicularis: *Vt arcus BC tangens eſt recta LC.*

XVIII. Secans eſt recta per alterum arcus terminum uſq; ad ſummitatem tangentis ducta. *Vt arcus BC ſecans eſt recta AL.*

XIX. Definitio quantitatis, quam habeant rectæ ad circulum applicatæ, eſt conſtructio tabularum Sinuum, Tangentium & Secantium. *Sinuum videlicet rectorum: non etiam verſorum. Nam ſinus verſi ex ſinibus rectis nullo negocio eliciuntur.* Sinus enim verſus minor cum ſinu recto complementi eſt æqualis radio. *Vt ſinus verſus minor EC. cum ſinu recto complementi ◡AE eſt æqualis radio ◡AC. Ergo ſi ſubtrahas ſinum rectum complementi ◡AE de radio ◡AC, reſtat ſinus verſus EC.* Sinus autem verſus maior eſt æqualis radio cum ſinu recto exceſſus coniuncto. *Vt ſinus verſus maior GE eſt æqualis radio GA cum ſinu exceſſus ◡AE coniuncto. Ergo ſi ad radium GA addas ſinum rectum exceſſus AE, habebis ſinum verſum arcus GFB. Itaq; tabulis ſinuum verſorum non eſt opus. Pro ſubtenſis verò ſinus recti uſurpari poſſunt. Nam ſinus recti ſunt ſemiſſes ſubtenſarum. Ergo ſi ſinum maximum habeas pro ſubtenſa maxima: etiam ſinus non maximi pro ſubtenſis non maximis haberi poterunt. Nam quæ eſt ratio totius ad totum: eadem eſt ratio dimidii ad dimidium, v.g. Quæ eſt ratio 10. ad 6. eadem eſt ratio 5. ad 3.*

XX. Tabulas Sinuum, Tangentium & Secantium vulgo canonem Triangulorum vocant. Rheticus vocat canonem doctrinæ Triangulorum. Vieta vocat canonem Mathematicum.

XXI. Tabulæ Sinuum, Tangentium & Secantium, non ulterius extenduntur, quàm uſq; ad quadrantem. *Nam arcuum*

quadrante majorum sinus recti iidem sunt, qui minorum: per 12. hujus. Tangentes verò & secantes arcuum quadrante majorum nullæ esse possunt, per 17. & 18. hujus.

XXII. Tabulæ Sinuum, Tangentium & Secantium, vulgo construuntur ad singula scrupula prima. Rheticus construxit ad decades scrupulorum secundorum. *Nos cætera quidē scrupulis primis contenti fuimus: sub initium verò & finē quadrantis, etiam scrupula secunda, vel dena, vel bina, vel singula adhibuimus: prout necessitas exegit.*

XXIII. Ad constructionem Tabularum Sinuum, Tangentium & Secantium, ante omnia radius certarum partium est assumendus.

XXIV. Quarumcunque partium radius assumatur, Sinus, Tangentes & Secantes ad eum ferè omnes sunt irrationales, hoc est, numero partium integrarum vel etiam fractionum præcise verarum inexplicabiles, per 51. p. 1. Itaque Tabulæ Sinuum, Tangentium & Secantium exactæ nullo modo dari possunt. Tales autem dari & possunt & debent, in quibus nullus numerus absit à verò per integram earum partium, quarum radius est assumtus. *Vt, si radius sit assumtus partium 10000000, nullus earum tabularum numerus debet abesse à vero per unam particularum 10000000.*

XXV. Hanc accurationem ut assequaris, vel fractiones in supputandis tabulis non negligas: vel radium multò quàm pro tabularum hypothesi majorem ad constructionem tabularum assumas oportet.

XXVI. Atqui fractiones simul cum integris ad calculum adhibere valdè tædiosum est. Adde quod ferè nullæ fractiones hic sunt exquisitè veræ. Ergo radius ad constructionem tabularum tantus assumatur, quantus si assumatur, error in tot à sinistra numeris, quot in tabulis collocatos volumus, inesse nullus possit: numeri verò à dextra versus sinistram erro-

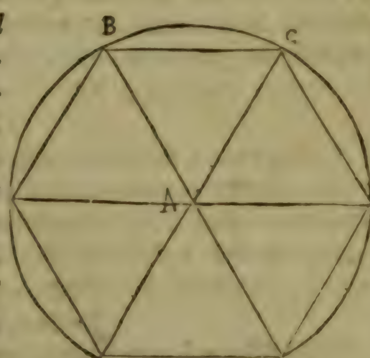
nei

nei poſt ſupputationem finitam abſcindantur. *Sic Regiomontanus cum vellet ſupputare tabulas Sinuum ad partes radii 6000000. aſſumſit radium particularum 60000000000. & finitâ ſupputatione de ſingulis ſinibus ita repertis à dextra ſiniſtrorſum abſcidit notas quatuor. Sic Rheticus cum vellet tabulas ſinuum ſupputare ad partes radii 10000000000. aſſumſit radium particularum 1000000000000000. & finitâ ſupputatione de ſingulis ſinibus à dextra ſiniſtrorſum abſcidit notas quinq;. Nos ad principia Canonis exquirendum aſſumſimus radium particularum 100000 00000 00000 00000 00000. In ipſo vero Canone radium poſuimus pro neceſſitate varium: ſicut infra ſuo loco dicetur.*

XXVII. Aſſumto radio partium quarumcunq; principiò ſinus rectos omnium arcuum quadrante minorum iiſdem in partibus inquires: tum ex ſinibus illis rectis, Tangentes & Secantes deduces.

XXVIII. Sinus recti quoad conſtructionem tabularum, ſunt primarii vel ſecundarii. Sinus primarii dicuntur, à quibus reliqui deducuntur.

XXIX. Sinum primarium nunc ſtatuo unicum, nempe Sinum totum, ſive radium: qui eſt æqualis lateri ſexanguli circulo inſcripti, hoc eſt, ſubtenſæ ſexaginta graduum. *Quod ſic demonſtratur. Sit latus ſexanguli circulo inſcripti BC. Quia igitur BC arcus, eſt ſexaginta partiũ, ex theſi: ideo etiam angulus BAC, eſt ſexaginta partium per ſextam primi. Ac proinde anguli ABC, & ACB, ſimul ſumti ſunt 120. partiũ, per 49. primi. Atqui anguli ABC & ACB, ſunt æquales, per 5. primi. Nam latera AB & AC, ipſis oppoſita ſunt æqualia: quippe duo*



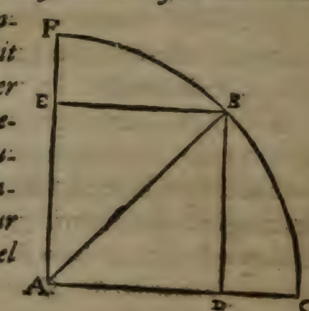
radii. Ergo unusquisque eorum angulorum est 60. partium. Atqui tot partium erat etiam angulus BAC. Ergo Triangulum ABC, est æqualium angulorum, Igitur & æqualium laterum, per 5. p. 1. Atqui latera AB & AC, sunt radii: per structuram. Igitur etiam latus BC est radius. Sinus ergo totus sive radius est æqualis lateri sexanguli circulo inscripti: quod demonstrandum erat.

XXX. Ex sinu toto deduco reliquos sinus omnes, per sequentia nouem problemata.

PROBLEMA PRIMVM. Dato sinu recto arcus quadrante minoris, sinum complementi reperire.

REGVLA. Quadratum sinus dati subtrahe à quadrato radii: radix residui est sinus complementi.

RATIO REGVLÆ. *Nam sinus arcus cum sinu recto complementi & radio constituit Triangulum in concursu duorum sinuum rectangulum. Vt sinus rectus BD cum sinu complementi AD & radio AB, constituit Triangulum BDA rectangulum ad D, per 3. consect. 12. hujus. Ergo latera includentia rectum BD & DA, æquè possunt hypotenusæ AB, per 50. p. 1. Subtracto igitur quadrato BD, de quadrato AB, relinquitur quadratum AD, cujus radix AD vel EB, est sinus complementi FB.*



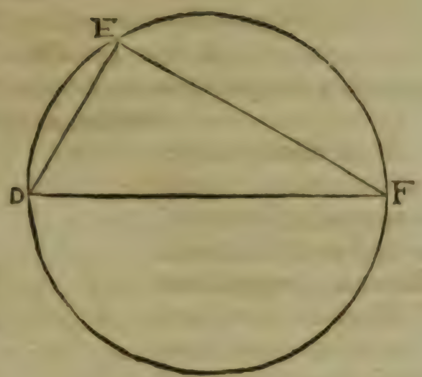
EXEMPLVM. *Sit radius AB. 10000000. Sinus BD 5000000, nempe sinus arcus XXX. graduum. Quadratum radii AB. est 100000000000000. Quadratum sinus BD est 25000000000000. Hoc si subtrahas de quadrato 100000000000000. restabit quadratum 75000000000000. Cujus radix 8660254. erit sinus AD vel EB, competens arcui FB, 60. graduum.*

Eodem modo,

Data subtensa arcus semicirculo minoris, subtensam complementi ad semicirculum invenire licet.

Nam,

Nam, vt ſinus arcus cum ſinu complementi & radio cōſtituit triangulum rectangulum, per 3. conſ. 12. hujus. Ita ſubtenſa arcus cum ſubtenſa complementi ad ſemicirculum & diametro, conſtituit triangulum rectangulum, per 1. conſect. 53. primi. Ergo ſi quadratum ſubtenſæ datæ auferas à quadrato diametri, reſiduum erit quadratum ſubtenſæ complementi.

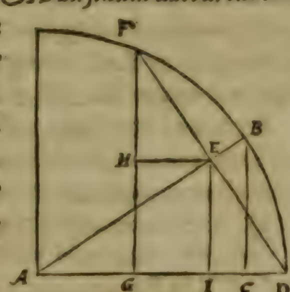


Vt, in propoſito diagrammate, ſi quadratum ſubtenſæ DE auferas à quadrato diametri DF. reſiduum erit quadratum ſubtenſæ EF.

XXXI. PROBLEMA SECVNDVM. Dato ſinu recto arcus, unà cum ſinu complementi, ſinum arcus dupli reperire.

REGVLA. Sinum rectum arcus multiplica per ſinum complementi: productum divide per radium: & habebis dimidium ſinum arcus dupli.

RATIO REGVLÆ. *Nam, ut radius AB ad ſinum dati arcus BD, nempe ad rectam BC: cui æquatur DE: ita ſinus complementi AE ad rectam EI, ſive HG. cuius duplum FG eſt ſinus arcus FD. Nam in triangulo FGD recta HE parallela baſi GD. ſecat crura FG & FD proportionaliter, per 45. p. 1. Atqui biſecat crus FD in E. Ergo biſecat etiam crus FG in H.*



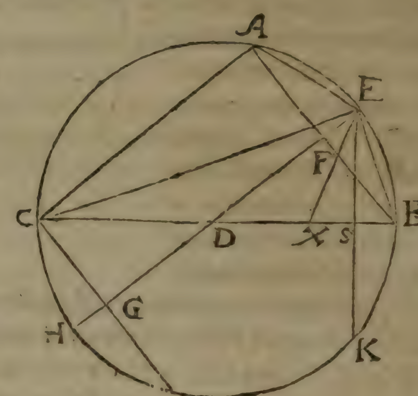
EXEMPLVM. *Sit datus ſinus arcus BD. 35. gr. recta ED vel BC*

E 3 5735764.

5735764 unà cum ſinu complementi ◡AC vel ◡AE. 8191520. Quæratur autem ſinus arcus dupli, nempe ſinus FG. Dico: ut ◡AB 10000000. ad BC. 5735764. ita ◡AE. 8191520. ad EI. ſive HG. 4698462. cuius duplum FG. 9396924. eſt ſinus arcus dupli FD. 70. gr.

Eodem modo,

Si per ſubtenſas agere libeat, erit: ut CB. diameter ad BE ſubtenſã arcus ſimpli BE. ita CE ſubtenſa complementi CAE, ad ES. dimidiam ſubtenſam dupli arcus EBK. *Quia triãgula ECB & ECS. ſunt æquiangula: propter cõmunem ad C. & æquales CEB & CSE. qui utriq; ſunt recti, ille quidẽ per 53. p. 1. hic verò per ſtructuram & per 23. p. 1.*



Vel facilius ſic:

Vt DE radius ad EC ſubtenſam complementi, ita EA ſubtenſa data ad AB ſubtenſam dupli arcus. *Valet conſequentia: quia triangula obtuſangula CDE & EAB ſunt æquiangula, propter æquales ECB & EAB: itemq; CEH & EBA: qui ſunt æquales propter menſuras eorum EB, ◡AE, & CH æquales; per theſin.*

EXEMPLVM *hujus poſtremi modi. Sit data ſubtenſa EB. 50. gr. 8452366. unà cum ſubtenſa complementi CE. 18126156. quæratur autẽ ſubtenſa arcus dupli AB. Dico:*

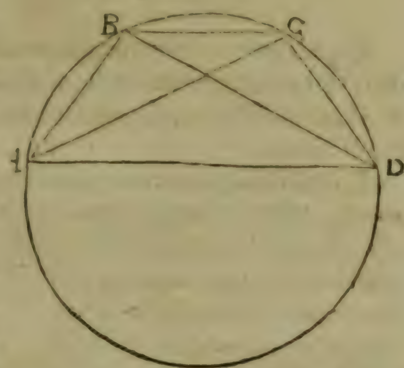
Vt DE. 10000000 *ad* EC. 18126156.
ita EB. 8452366 *ad* AB. 15320890.

XXXII. PROBLEMA TERTIVM. Data ſubtenſa arcus ſemicirculo minoris, unà cum ſubtenſa dupli arcus, ſubtenſam tripli arcus invenire.

REGVLA.

REGVLA. Quadratum ſubtenſæ ſimpli arcus aufer à quadrato ſubtenſæ dupli arcus: reſiduum divide per ſubtenſam ſimpli arcus: Quotus erit ſubtenſa tripli arcus.

RATIO REGVLÆ.



Nam ſubtenſæ, ſimpli, dupli, & tripli arcus, ſi legitimè cōjungantur, conſtituunt figuram quadrilateram circulo inſcriptam & diagoniis interſectam: ut ex adjuncto diagrammate vides. In quo ſubtenſa ſimpli arcus eſt AB, vel BC, vel CD. ſubtenſa dupli arcus eſt AC vel BD. ſubtenſa tripli arcus eſt AD. Atqui in tali figura rectangulum factum à diagoniis æquatur duobus rectangulis laterum ſibi invicem oppoſitorum, per 54.p.1. Ergo, ſi rectangulum factum à lateribus AB & CD; hoc eſt, quadratum ſimpli arcus AB: ſubtraham à rectangulo diagoniorum; hoc eſt, à quadrato dupli arcus AC: reſtabit rectangulum laterum BC & AD. quod diviſum per latus BC exhibebit latus AD. per 40.p.1. Quod demonſtrandum erat.

EXEMPLVM. *Sit data ſubtenſa AB vel BC 10. gr. 1743115. unà cum ſubtenſa AC. 20. gr. 3472964. Quæratur autem ſubtenſa AD. 30. gr.*

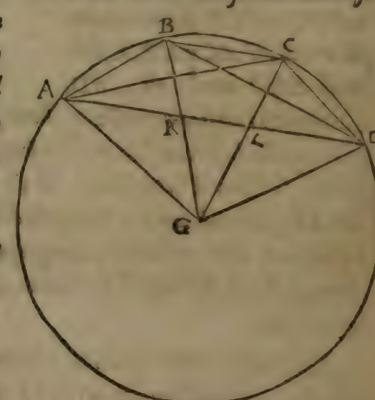
Quadratum ſubtenſæ AC. eſt — — — — —	12061478945296
Quadratum ſubtenſæ AB. eſt — — — — —	3038449903225
Subtractione facta reſtat rectangulum factum ex BC & AD — — —	9023029042071
Quod diviſum per ſubtenſam BC — — — —	1743115
Exhibet ſubtenſam AD — — — — — —	5176381

Vel

Vel facilius, & ſine data ſubtenſa dupli arcus, ſic:

Quadratum ſubtenſæ datæ radio diviſum, ſubtrahe à radio: reſiduum per ſubtenſam datam multiplicatum radioq; diviſum bis adde ad ſubtenſam datam, & habebis ſubtenſam tripli arcus.

RATIO *præcepti patet ex adiuncto ſchemate. In quo primum triangula AGB & BAK ſunt æquiangula, propter communem ABK vel ABG, & æquales AGB & BAK. qui ſunt æquales per 51. p. 1. quia nimirum arcus BCD, qui angulum BAK vel BAD in circumferentia conſiſtentem obit, eſt duplus ad arcum AB. qui angulum AGK in centro conſiſtentem obit. Ergo, ut AG ad AB. ita AB ad BK. quo ſubtracto de BG reſtat KG. Deinde triangula GBC & GKL ſunt etiam æquiangula propter baſes BC & KL parallelas, per 36. p. 1. Ergo, ut GB ad BC, ita GK ad KL. Deniq; triangulum BAK eſt ad baſin æquiangulum: quippe triangulo AGB ad baſin AB æquiangulo ſimile: ut nuper demonſtratum fuit.*



Quia igitur triangulum BAK eſt ad baſin æquiangulum, ideo eſt æquicrurum, per 26. p. 1. ac per conſequens, crura AB & AK ſunt æqualia. Atqui ſegmenta AK & LD etiam ſunt æqualia: per ſtructuram. Ergo, ſi AK & LD addam ad KL, perinde eſt ac ſi rectam AB bis ad rectam KL addiderim.

EXEMPLVM. *Sit data eadem ſubtenſa AB quæ ante: nempe ſubtenſa 10. gr. 1743115. quæratur autem ſubtenſa tripli arcus AD.*

Qua-

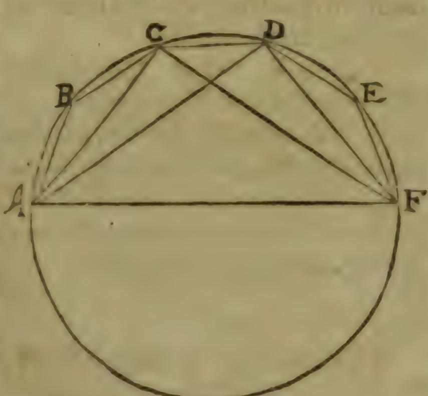
Quadratum ſubtenſæ datæ AB eſt — — — —	303844	9903225
Ergo recta BK eſt — — — — — — —	303845	
Quæ ſubtracta de radio BG — — — —	10000000	
Relinquit rectam KG — — — — —	9696155	
Quæ multiplicata per datam AB — — — —	1743115	
Producit rectangulum — — — — —	1690151	3222825
Quod radio diviſum exhibet rectam KL — — —	1690151	
Ad quam bis addita recta AB — — — —	1743115	
	1743115	
Efficit rectam AD — — — - - — —	5176381	

XXXIII. PROBLEMA QVARTVM. Data ſubtenſa arcus ſemicirculo minoris, unà cum ſubtenſa dupli & tripli arcus, ſubtenſam quintupli arcus invenire.

REGVLA. Quadratum ſubtenſæ dupli arcus aufer à quadrato ſubtenſæ tripli arcus: reſiduum per ſubtenſam datam diviſum erit ſubtenſa quintupli arcus.

RATIO *eſt eadem quæ fuit in prima ſolutione tertii problematis: quia nimirum ſubtenſæ dupli, tripli, & quintupli arcus, legitimè inter ſe conjunctæ efficiunt figuram quadrilateram duabus diagoniis interſectam, atq. adeo ad 54.p.1. accommodatam, &c.*

EXEMPLVM. *Sit data ſubtenſa duorum graduum CD. 349048. & quæratur ſubtenſa 10. graduum. AF. Primũ inveſtigentur ſubtenſa dupli arcus. h. e. ſubtenſa arcus AC. 4. graduũ: per problema ſecundum; & ſubtenſa tripli arcus, h. e. ſubtenſa arcus AD. 6. graduum: per problema tertium.*



Subtenſa AC. erit — 697990. *ferè*
Subtenſa AD. erit — 1046719.
Deinde quadrentur illæ ſubtenſæ: & fient,

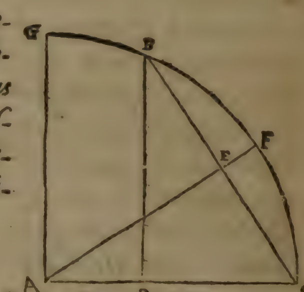
Quadratum ſubtenſæ tripli arcus AD. — — —	1095620664961
Quadratum ſubtenſæ dupli arcus AC. — — —	487190040100
Quo ſubtracto de quadrato AD. relinquitur rectangulum ex AD & CD. — — —	608430624861
Quod diviſum per latus CD. — — — —	349048
Exhibet latus AF. — — — — — —	1743114

NOTA. *Eodem artificio ſeptupli, nonecupli, undecupli &c. arcus ſubtenſas invenire poſſis, ſi ſit opus. Nam quadratum ſubtenſæ arcus tripli ſubtractum à quadrato ſubtenſæ arcus quadrupli relinquit numerum, qui diviſus per ſubtenſam arcus ſimpli exhibet ſubtenſam arcus ſeptupli. Sic, quadratum ſubtenſæ arcus quadrupli ſubtractum à quadrato ſubtenſæ arcus quintupli, relinquit numerum, qui diviſus per ſubtenſam arcus ſimpli exhibet in Quoto ſubtenſam arcus nonecupli: & ita deinceps in infinitum.*

XXXIV. PROBLEMA QVINTVM. Dato ſinu arcus, unà cum ſinu complementi, ſinum arcus dimidii reperire.

REGVLA. Quadratum ſinus recti arcus dati conjunge cum quadrato ſinus verſi ejuſdem arcus (*quem ſinum verſum reperies ſubtracto ſinu complementi à radio.*) Radix ſummæ iſtorum duorum quadratorum erit ſubtenſa arcus dati: cujus ſemiſſis erit ſinus arcus dimidii.

RATIO REGVLÆ. *Nam ſinus rectus & verſus æquè poſſunt ſui arcus ſubtenſæ. Vt, in adjuncto ſchemate, BD ſinus rectus arcus BC; & DC ſinus verſus ejuſdem arcus, æquè poſſunt ſubtenſæ illius arcus BC. per 50. p. 1. Cujus ſubtenſæ dimidium EC. eſt ſinus arcus dimidii FC.*



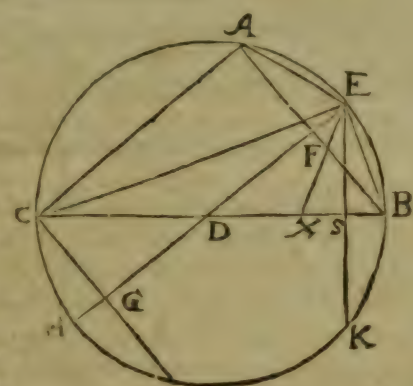
EXEMPLVM. *Sit arcus BC. XXX. graduum ſinus rectus BD.* 5000000. *ſinus verſus DC.*1339746.

Qua-

Quadratum sinus recti BD. erit	— — —	2500000000000
Quadratum sinus versi DC. erit	— — —	1794919344516
Summa horum duorum quadratorum erit.	— —	2679491934516

Radix inde extracta 5170380. erit subtensa arcus dati BC. XXX. graduum. Dimidium vero illius subtensæ, nempe recta EC. 2588190, erit sinus arcus dimidii FC. XV. graduum.

Aliter, per ſubtenſas.



REGVLA. Subtenſam complementi aufer à diametro. Reſiduum radio multiplicatum erit quadratũ ſubtẽſæ dimidii arcus *v. g. Dati arcus AB ſubtenſam complementi ſubtenſam complemẽti AC, cui æqualis ponitur CX, aufer à diametro CB. Reſiduũ XB multiplicatũ radio DB. æquale erit quadrato rectæ EB ſubtenſæ dimidii arcus EB.*

RATIO REGVLÆ. *Nã, ut DB ad EB: ita EB ad XB. Ergo DB, BE, & XB ſunt tres rectæ continuè proportionales. Et per conſequens, oblongum extremarum DB & XB, æquatur quadrato mediæ BE, per 43. p. 1. Ideo autem eſt, ut DB ad BE, ita BE ad XB: quia triangula DEB & XEB ſunt æquiangula: propter communem DBE, & æquales EXB & DEB. Qui ſunt inter ſe æquales: quia uni tertio, nempe angulo communi DBE ſunt æquales. Idq; ideo, quia triangula DEB & XEB ſunt æquicrura: ergo ad baſes æquiangula, per 26. p. 1. Triangulum DEB eſt æquicrurum: quia utrumque crus DE & DB, eſt radius. Triangulum XEB, eſt æquicrurum. Quia recta XE æquatur rectæ AE:*

ergo etiam rectæ EB. Nam rectæ AE & EB. ſunt æquales, per ſtructuram. Recta autem XE æquatur rectæ AE: quia vtræq; æqualibus angulis ACE & ECX ſubtenduntur in terminis crurum æqualium. Recta enim CX eſt æqualis rectæ CA per theſin: recta vero CE eſt utriq; triangulo, nempe triangulo ACE, & triangulo ECX communis. Quia igitur trianguli DEB. & XEB ſunt æquiangula; ideo eſt, ut DB ad BE, ita BE ad BX. Quod demonſtrandum erat.

EXEMPLVM. *Sit data ſubtenſa arcus AB, 60.gr.* — — 10000000
unà cum ſubtenſa complementi AC — — — — — 17320508
De diametro CB — — — — — — — — — 20000000
Subtrahe ſubtenſam complementi AC vel CX — — — 17320508
Reſtabit XB — — — — — — — — — 02679492

Quod multiplicatum radio DB. hoc eſt, auctum cyphris ſeptem; hoc modo:

$\dot{0}2\dot{6}7\dot{9}4\dot{9}2\dot{0}0\dot{0}0\dot{0}0$

Erit quadratum ſubtenſæ arcus dimidii EB. Cujus quadrati radix 05176381 eſt ipſa ſubtenſa EB.

Cæterum, ideo in his operationibus cyphræ etiam ab initio ſunt apponendæ, ſi calculus ita ferat, ut puncta radicis extrahendæ (ſive illa ſit quadrata, ut hîc, ſive cubica, ſive ſolida, ut erit in ſequentibus nonnullis exemplis) convenienter annotari poſſint. Numeri enim à dextra, ſi radius aſſumatur magnus, nō ſemper omnes aſſcribuntur. Quo in caſu incerta eſſet punctorum radicalium annotatio, ſi cyphræ ab initio non aſſcriptæ eſſent. Sed & alium uſum habet iſta cyphrarum ab initio aſſcriptio. Oſtendit enim, omnes iſtas ſubtenſas eſſe minores radio, & quaſi partes quaſdam radii: quæ partes vulgo ſic ſcriberentur. $\frac{5176381}{10000000}$. *Sed multò compendioſior & ad calculum accommodatior eſt iſta ſcriptio. 05176381. Omnino autem idem iſti numeri valent, ſicut hi duo numeri 09. &* $\frac{9}{10}$ *idem valent.*

Adhuc aliter, per ſubtenſas, & per Algebram: ex mente Iuſti Byrgii.

(Algebram qui neſcit, Algebraica tranſiliat, hic & per totum reliquum librum. Non enim neceſsitati, ſed tantum curioſitati hæc data ſunt.)

REGVLA.

REGVLA. Quadratum ſubtenſæ datæ divide per *4 q—1 6q.* Quotus erit quadratum ſubtenſæ arcus dimidii.

RATIO REGVLÆ. *Nam quadratum ſubtenſæ cujuſcunq; arcus æquatur quatuor quadratis, minus uno biquadrato ſubtenſæ arcus dimidii. Quod ſic demonſtratur.*

Sit data ſubtenſa arcus ACB. recta AB. Quæratur autem ſubtenſa arcus dimidii nempe recta AC vel CB. Diameter FC. ſit 2. ut radius fiat. 1. Sicut ponitur in tabulis Sinuum: etſi ibi multæ cyphræ 1. addantur: quod hic non eſt opus. Quæſita deinde ſubtenſa AC vel CB ponatur

tur Algebraicè unius radicis ſive lateris: atq; adeo CB ſit 1 l. Ergo quadratum CB. erit 1 q. Nam 1 l. per 1 l. multiplicatum dat. 1. q. Hoc quadratum ſi auferas à quadrato diametri 2. nempe à 4. reſtabit 4—1 q quod eſt quadratum rectæ FB. per 50. p. 1. quia videlicet triangulum FCB. eſt rectangulum ad B per 1. conſ. 53. p. 1. Ergo recta FB. eſt radix quadrati 4—1 q. Quæ radix ſic notetur l 4—1 q. vel ſic √ 4—1 ẑ: prout quiſque notare conſuevit. Ducatur etiam radius EB: ut fiat triangulum EFB. Iam, triangula EFB & ACB ſunt æquiangula: propter æquales

CFB & CAB: qui ſunt æquales propter menſuram eorum æqualem, ſive potius eandem, quæ menſura eſt arcus CB. Angulo autem CAB æqualis eſt angulus CBA; & angulo CFB vel EFB æqualis eſt angulus EBF; per ſtructuram. Ergo etiam tertius ACB tertio FEB. eſt æqualis: per 4. conſ. 49. p. 1. Quia igitur triangula EFB & ACB ſunt æquiangula, ideo eſt ut EF. 1. ad FB. l 4—1 q. ita AC. 1 l. ad AB. In quo calculo, ut terminũ ſecundum cum tertio multiplicare poßis, quia ſecundus terminus eſt ſurdus, etiam tertium terminum ſurdum effice, multiplicando 1 l. per ſeipſum, ut fiat 1 q: quo facto recta AC. erit l 1 q. Iam multiplica l 4—1 q. per l 1 q. hoc modo.

Multiplicandus	—	—	*l 4—1 q.*
Multiplicans	—	—	*l 1 q.*
Factus	—	—	*l 4 q—1 bq.*

Ergo ſubtenſa AB æquatur lateri quatuor quadratorum minus uno biquadrato aſſumptæ radicis AC. Et per conſequens, quadratum ſubtenſæ AB æquatur quatuor quadratis minus uno biquadrato aſſumtæ radicis ſive ſubtenſæ dimidii arcus AC vel CB. Atque adeo, ſi quadratum ſubtenſæ AB dividas per 4 q—1 bq. prodibit unum quadratum ſubtenſæ dimidii arcus AC vel CB. Quod demonſtrandum erat.

Cæterum, quomodo datæ cujuslibet ſubtenſæ quadratum dividi poſſit per 4q—1 bq. ſubjecto exemplo manifeſtum faciam.

EXEMPLVM. *Sit data ſubtenſa AB, LX. grad.* 10000000. *ejuſq; quadratum* 100000000000000. *Hoc quadratum dividendũ eſt per 4 q—1 bq. Quia igitur per 4 q—1 b q commode dividere non poſſum, addo utrinque, nempe & ad diviſorem & ad dividendum 1 bq (quæ additio in diviſore fit, abjecto ſigno minus cum ſuo numero) ut inter ſeſe æquentur 4q. &* 100000000000000. *+1 bq: tumque divido* 100000000000000 *+1 bq. per 4 q. vel, quod idem eſt, divido numerum* 100000000000000 *per 4. Sic ut inventi uniuſcujuſq; quoti particularis quadratum (quod revera eſt biquadratum: quia quotus eſt quadratum) cum ſuo complemento addam ad numerum dividen-*

dividendum, antè, quàm divisorem. 4. promoveam. Quæ additio, ut debitis locis fiat, puncta radicum quadratarum ante omnia ad numerũ dividendum adnotentur, & deinde procedatur eo modo, qui sequitur.

Quadratum subtensæ AB. 60. gr.

1ȯoȯoȯoȯoȯoȯoȯ
(*)(*)Dic.4in 1(o
4in10(2
B.4. Adde ad 100

Quadratum de 2. est 4. B.

Fit. 104. Dic. bis 4. sunt
8. Subtrahe

Quadratum de 6. est 36.
Complementum---24.
Summa 276. D.

Rest. 2400.
(4) Dic.4 in 24 (6
D 276 Adde

Complementum autem illud reperitur, multiplicando radicem 6. per duplum antecedentis radicis 2. hoc est, per 4. Nam quater 6. est 24.

2676
24 Subtrahe

27600. (7
(4)
3689 Adde

31289
28 Subtrahe

328900.
(4)
48141 Adde

(9:--Deinceps numeri subtrahendi non sunt asscripti, ut nec in vulgari divisione asscribi solent.

1704100 (4
(4)
214336 Adde

31843600. (9
(4)
4820001. A.

66660100 (1
(4)5358981. A.

3201908100 (9
(4)
482308461. A.

8421656100 (2

(4)

1071796764.A.

149345286400 (4

(4)

21435935376.A.

1078122177600 (3

(4)

160769515449.A.

3889169304900 (1

(4)535898384861.A.

42506768976100 (1

(4)5358983848621.A.

78657528247210 0 (2

(4)

1071796769724 44.A.

9375495944 4544 Sequeretur 2.

Geneſis biquadratorum particularium, unde ſenſim componitur biquadratum totum.

00(2

2

A. 4 (6

46

B. 276

676(7

527

C. 3689

71289.(9

5349

48141

A Quadratum radicis 2.

B Quadratum radicis 6. cum ſuo complemento. Quadratum radicis 6. eſt 36. complementum ex multiplicatione præcedentis radicis dupla, per hanc radicem 6. factum eſt 24. Hæc debito modo (qui modus iam ſupra oſtenſus eſt) inter ſe coniuncta faciunt 276.

C. Quadratũ radicis 7. cum ſuo complemento facto ex multiplicatione dupla radicis antecedẽtis 26. per hanc radicem 7.

717-

7177041 (4
53584
214336

71791843 6(9
535 889
4823 001

71796666601 (1
5358981

7179672019081.(9
53589829
482308461

717967684216561.(2
535898382
1071796764

71796769493452864.(4
5358983844
21435935376

7179676970781221776.(3
53589838483
160769515449

71796769723889169 3049 (1
535898384861

717967697244250676897 61.(1
5358983848621

71796769724478657528247 21.(2
53589838486222
107179676972444

717967697244893754959444544. Biquadratum totum.

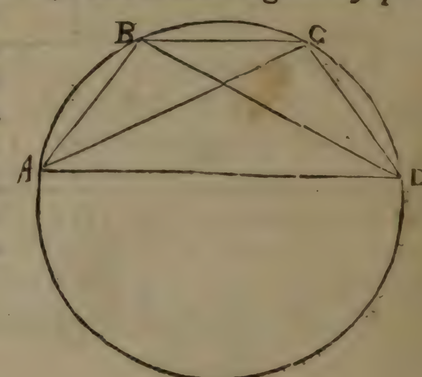
Examen præcedentis analyſeos per Syntheſin contrariam.

1 q.	026794919243112	
4 q.	107179676972448	
1bq.	007179676972448.	Subtrahe
	100000000000000	Redit quadratum ſubtenſæ. LX. grad.

XXXV. PROBLEMA SEXTVM. Data ſubtenſa arcus, ſubtenſam tertiæ partis illius arcus invenire.

REGVLA. Subtenſæ datæ ſubtriplum nonnihil auctum pone pro ſubtenſa quæſita, & per illam inquire ſubtenſam datam juxta doctrinam tertii problematis. Quam ſi eandem inveneris, habes quod quæſiviſti. Sin autem: nota differentiam per Plus vel Minus, & repetitâ eadem operatione per aliam poſitionem ſubtenſæ quæſitæ, iterum nota Plus vel Minus. Quo facto poſtea per Regulam falſi veritatem infallibiliter invenies.

RATIO *cur ſubtriplum ſubtenſæ datæ nonnihil augendum ſit prius quàm pro ſubtenſa quæſita probabiliter poni poſſit, hæc eſt: quia ſubtenſa ſubtripli arcus ter ſumta neceſſario major eſt quàm ſubtenſa tripli arcus. v.g. tres rectæ, AB, BC, & CD. ſimul ſumtæ neceſſariò majores ſunt, quàm recta* $\smile$*AD.*



RATIO

RATIO reliquæ operationis usq; ad Regulam falsi, patet ex demonstratione tertii problematis.

RATIO REGVLÆ falsi scitur ex Arithmeticis.

EXEMPLVM. Sit data subtensa XXX. graduum AD. 5176381. ferè. Quæratur autem subtensa subtripli arcus, nempe arcus. X. graduum. AB.

Data subtensa AD. est — — —	5176381
Eius subtriplum est — — —	1725460
Id nonnihil auctum, est — — —	1730000
vel — — —	1740000
vel — — —	1750000
Positio prima sit — — — —	1730000
Per eam inquisita subtensa tripli arcus AD. iuxta doctrinam tertii problematis, erit —	5138223
At debebat esse — — —	5176381
Ergo est Minus — — —	38158
Positio secunda sit — —	1740000
Per eam inquisita subtensa tripli arcus AD. iuxta doctrinam tertii problematis, erit —	5167320
Atqui debebat esse — — —	5176381
Ergo adhuc est Minus — —	9061

Iam, iuxta doctrinam Regulæ falsi, multiplica per crucem, Minus primum per positionem secundam, & Minus secundum per positionem primam: & quia utrobiq; est Minus, producta ab invicem subtrahe, & habebis numerum dividendum, hoc modo:

Productum primum	66394920000
Productum secundum	15675530000
Dividendus	50719390000

Item, de Minore uno ſubtrahe Minus alterum, & accipies diviſorem, hoc modo:

Minus unum — — —	38158	
Minus alterum — — —	9061.	Subtrahe.
Diviſor — — —	29097	

Diviſio ipſa.

```
Dividendus. 50719390000
Diviſor.    29097 (1—1
           ------------
            216223 (7—8
             29097
            203679
           ------------
             125449 (4—3
              29097
             116388          7
           ------------      0
              90610 (3---6 X 0
              29097          7
              87291
           ------------
               33190 (1—7
               29097
           ------------
                40930 (1—8
                29097            7
           ------------------    0
                118330 (4—3  X 0
                 29097           7
                116388
           ------------------
                  1942
```

Diviſione facta prodit pro ſubtenſa ◡AB, uti vides, numerus 1743114. *Per quem numerum iterum operare ut per poſitionem primam vel ſecundam, & rurſum prodibit Minus: ſed valde parvum, nempe.* 3. *Sume igitur numerum numero* 1743114. *paullo majorem, nempe* 1743115. *& repetitā operatione priore invenies ſubtenſam ◡AD. prorſus talem, qualis initio data erat nempe* 5176381. *quæ tamen in fine eſt juſto major: ideo etiam ſubtenſa* 1743115. *in fine erit juſto major:*

verior

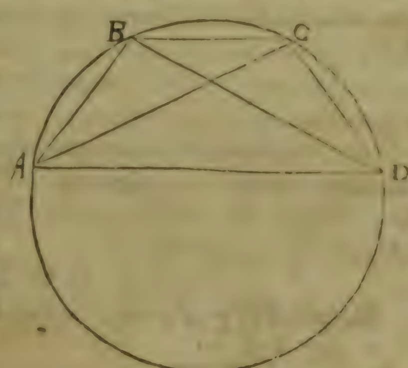
verior tamen quàm ſubtenſa 1743114: ut ex calculo apparet: quia ſcilicet nullam apparentem differentiam inter AD. datam & quæſitam relinquit.

NOTA. *Regula falſi ſemper tibi veritatem oſtendet ad minimum in duplo pluribus cyphris, quàm poſitio una aut altera notas ſignificativas (quales ſunt 1.2.3.4.5 6.7.8.9. non autem 0.) ad ultimam uſque iuſtas habuerit. v.g. In propoſito exemplo poſitio utraque ſeorſim ſumta habuit tres cyphras ſignificativas ad ultimam uſque iuſtas, nempe 173. vel 174. Ergo regula falſi veritatem exactè prodidit in ſex cyphris, nempe in iſtis 174311. Unde patet ſi primam poſitionem feceris 17431140000000, ſecundam 17431150000000. te ad extremam habiturum eſſe ſubtenſam exactiſſime veram ad radium 100000000000000. Quod ſi iſtam ſubtenſam rurſus quatuordecim cyphris auxeris, & ultimam cyphram ſignificativam in una poſitione minorem, in altera maiorem ſumſeris, accipies ſubtenſam quæſitam exactiſſimè veram ad radium 100000 00000 00000 0000000000000; & ita deinceps: modò ſubtenſam AD in tot partibus prius datam habueris.*

Aliter, per Algebram.

REGVLA. Subtenſam datam divide per 3 l—1 c. Quotus erit ſubtenſa tertiæ partis arcus dati.

RATIO REGVLÆ.



Nam ſubtenſa cujuſcunque arcus æquatur tribus radicibus minus uno cubo: qualium radicum una eſt ſubtenſa tertiæ partis illius arcus.

Quod ſic demonſtratur. Sit data ſubtenſa AD, arcus ABCD. Quæratur autem ſubtenſa tertiæ partis AB, vel BC, vel CD. Ponatur ſubtenſa tertia partis BC 1 l. Er-

 go ſub-

go subtensæ arcuum ad arcum BC. duplorum, nempe rectæ AC & BD singulæ erunt l 4q—1bq. per antecedentis problematis demonstrationem. Atqui figura ABCD, est figura quadrilatera, circulo inscripta & diagoniis intersecta. Rectangulum igitur diagoniorum AC & BD æquatur rectangulis laterum simul sumptis per 54 primi. Primum igitur multiplico diagonios invicem & existit inde quadratum 4q—1bq (nam surdum numerum per se ipsum multiplicare, nihil est aliud quam signum l abiicere.) Deinde multiplico latus AB per latus CD, hoc est, 1 l per 1 l. & existit inde 1 q. Quod subtraho de Quadrato diagoniorum, h. e. de 4q—1bq & restant 3q—1bq. pro rectangulo ex BC & AD facto. Quod rectangulum 3q—1bq. si dividam per latus BC. nempe per 1 l. resultat latus AD. 3 l—1c. Ergo 3l—1c. quorum laterum unum sit subtensa tertiæ partis, æquantur subtensæ arcus dati & per consequens si subtensa arcus dati dividatur per 3l—1c. quotus erit subtensa tertiæ partis. Quod demonstrandum erat.

Modus istiusmodi divisionis hic est. Subtensam datã divide per 3. addito uniuscujusq; quoti particularis cubo, cum suis complementis, ad numerum dividendũ, priusquam divisorẽ promoveas: à dextra istam additionem incipiendo, sub puncto unicuiq; cubo debito, & pro more extractionis radicis cubicæ ad numerum dividendum annotato. Dico: addito cubo, cum suis complementis. Nam cubus non unicum duntaxat habet complementum, ut quadratum: Sed cubus uniuscujusq; radicis post aliam radicem positæ, habet duo complementa. Quæ sic reperiuntur. Pro primo complemento, radix præcedens quadratur, idq; quadratum triplatur, & triplatum per sequentem radicem multiplicatur. Pro secundo complemento, radix præcedens triplatur, & hoc triplatum per quadratum sequentis radicis multiplicatur, ut sequentis exempli calculus, quem integrum asscripsi, ostendet.

EXEMPLUM.

Subtensa XXX grad. unde sit extrahenda subtensa X graduum.

0· 517· 638· 1

(3)(3)1 Adde (01

218

218 638 (7
(3)3 913. A.

12 551 100 (4
(3) 355 024.A.

906 124 000 (3
(3)27 295 407.A.

33 419 407 000 (1
(3) 911 466 991.A.

4 330 873 991 (1
(3) 91 152 451 231.A.

1 422 026 442 231 (4
(3)36 461 273 334 544.A.

258 487 715 565 544 Sequeretur 8
(3)

Quadrata particularia ſubtenſæ X.gr.

0. 1
01

001. 7
27
189

00289. 4
344
1376

0030276. 3
3483
10449

003038049. 1
34861

00303839761 1
348621

0030384324721. 4
3486224
13944896
003038446416966

Cubi particulares ſubtenſæ X. graduum.

C.0001 (1
3 913

C.0004 913 (7
355 024

C.0005 268 024 (4
27 295 407

C.0005 295 719 407 (3
911 466 991

C.0005 296 230 873 991 (1
91 152 451 231

C.0005 296 322 026 442 231 (1
36 461 273 334 544

C 0005 296 358 487 715 565 544 (4

Exqui-

Exquiſitio cuborum particularium ſubtenſæ decem graduum.

l 1
q 1
3
3
l 7
I Comple. 21
II. Compl. 147
Cubus 343
3913 Cubus radicis 7. cum ſuis complementis.

l 17 | l 17 | l. 4
q. 289 | 3 | q. 16
3 | 51 | c. 64
867 | q. 16
l. 4 | 306
I. Compl. 3468 | 51
II. Compl. 816 | 816
Ipſe cubus 64
355024 cubus radicis 4 cum ſuis complementis.

l. 174
q. 30276
3
90828
l. 3
272484
4698
27
27295407

l. 174 | l. 3
3 | q. 9
522 | c. 27
q. 9
4698

l. 1743 | l. 1743
q. 3038049 | 3
3 | 5229
9114147
5229
1
911466991

l. 17-

l. 17431	l.17431	l.174311	l.174311	l.4
	3		3	q.16
q.303839761		q.30384324721		
3	52293	3	522933	c.64
			q.16	
911519283		91152974163		
52293		l.4	3137598	
1			522933	
		364611896652		
91152451231		8366928	8366928	
		64		
		36461273334544		

Examen praecedentis analyseos per Synthesin contrariam.

1l.	01743114|8	Subtensa X. graduum.
3l.	05229344|4	
1c.	00052963|5	Subtrahe.
	05176380|9	Redit subtensa XXX. graduum.

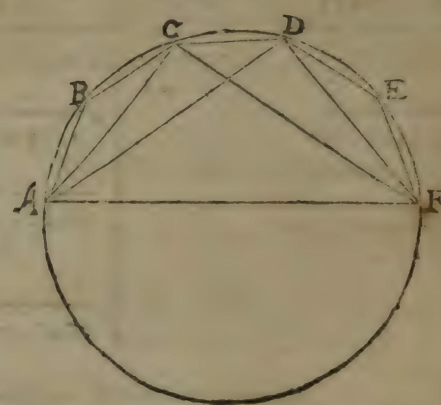
XXXVI. PROBLEMA SEPTIMVM. Data subtensa arcus, subtensam quintæ partis illius arcus invenire.

REGVLA. Subtensæ datæ sub quintuplum nonnihil au-ctum, pone pro subtensa quæsita, & per illam inquire subtensam datam, juxta doctrinam quarti problematis. Quam si eandem inveneris, habes quod quæsivisti. Sin autem: nota differentiam per Plus vel Minus, & repetita eadem operatione per aliam positionem subtensæ quæsitæ, iterum: nota Plus vel Minus; & deniq; per regulam falsi veritatem inquire, ut factum est in sexto problemate.

RATIO REGVLA *est eadem, quæ fuit in sexto problemate.*

H EXEM-

EXEMPLVM. *Sit data ſubtenſa decem graduum AF 1743115. Quæratur autem ſubtenſa quintæ partis, hoc eſt duorum graduum. CD.*



Subtenſa decem graduum eſt — —	1743115. *ferè.*
Eius ſubquintuplum eſt — — —	348623.
Poſitio prima ſit — — — —	349000.
Per eam inventa AF. eſt — — —	1742875.
At debebat eſſe — — — —	1743115.
Eſt ergo Minus — — —	240.
Poſitio ſecunda ſit — — —	349100
Per eam inventa AF. erit — —	1743373
At debebat eſſe — — — —	1743115
Eſt ergo Plus — — —	258
Cui adde Minus — —	240
Et habebis diviſorem — — — —	498

Deinde multiplica per crucem, nempe Minus per poſitionem majorem; & Plus per poſitionem minorem; eruntq;

Productum primum — — —	83784000
Productum ſecundum — — —	90042000. *Hæc adde*

Et habe-

Et habebis Dividendum. 173826000 —— 0
Divisor erat. — 498 (3 — 3
1494
2442
498 (4 — 7
1992
4506
498 (90 — 7
4482
2400
498 (4 — 2
1992
4080 6/3
498 (8 — 1 X 3
3984 0
96

Quotus, hoc est, subtensa duorum graduum CD. prodit. 349048. exquisitè vera.

Aliter, per Algebram.

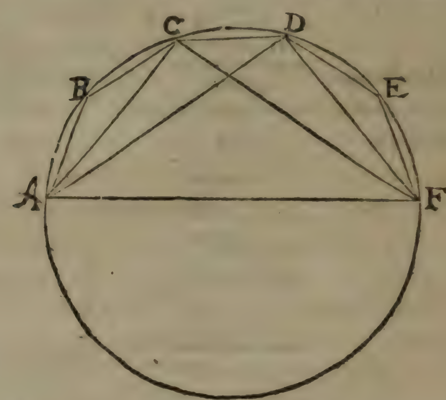
REGVLA. Subtensam datam divide per 5l — 5c + 1ß. Quotus erit subtensa quintæ partis arcus dati.

RATIO REGVLÆ. *Nam subtensa cuiuscunque arcus æquatur quinque radicibus, minus quinque cubis, plus uno solido: qualium radicum una est subtensa quintæ partis illius arcus. Quod sic demonstratur.*

Sit data subtensa AF, arcus ABF. Quæratur autem subtensa quintæ partis arcus ABF. v. g. subtensa arcus CD nempe recta CD. Ponatur CD unius radicis, sive quod idem est, CD sit 1 l. Ergo AC erit l4q -- 1bq. similiterque DF per problematis XXXI. demonstrationem. AD vero erit 3 l — 1c. Similiterque CF per problematis antecedentis demonstrationem. Iam in figura quadrilatera ACDF diagoniis AD & CF intersecta, rectangulum diagoniorum AD & CF est æquale rectangulis laterum oppositorum, nempe CD & AF, item AC & DF

 simul

ſimul ſumtis, per 54. primi. Primum igitur multiplico invicem diagonios AD & CF. Deinde multiplico invicem latera oppoſita AC & DF. Et factum hujus multiplicationis à facto diagoniorum ſubtra-



ho. Quod reſtat, eſt rectangulum reliquorum duorum laterum oppoſitorum CD & AF: quod rectangulum diviſum per rectam CD, relinquit rectam AF. Totus calculus Algebraicus ita habet.

AD. 3l—1c.	AC. l4q—1bq
CF. 3l—1c.	DF. l4q—1bq
9q—3bq.	AC, DF. 4q—bq.
—3bq+1qc.	
AD, CF. 9q—6.bq+1qc.	
AC, DF, 4q—1bq.	
CD, AF, 5q—5bq+1qc.	
Diviſor CD 1l.	
Quotus AF 5l—5c+1ß.	

Ergo

Ergo ſubtenſa dati arcus ◡ABF, nempe recta ◡AF æquatur 5 radicibus, minus 5 cubis, plus uno ſolido: qualium radicum una eſt ſubtenſa quintæ partis arcus dati. Et per conſequens, ſi ſubtenſam datam ◡AF dividam per 5 L - 5c + 1ß. Quotus erit ſubtenſa quintæ partis illius arcus, nempe recta ◡AB, vel BC, vel CD, &c.

Quod demonſtrandum erat.

Modus per 5L - 5c + 1ß. dividendi talis eſt. Super numero dividendo ante omnia notentur puncta & cubicis & ſolidis radicibus convenientia. Deinde numerus dividendus dividatur per 5. additis ſemper quoti inventi quinq. cubis, cum ſuis complementis, & ſubtracto uno ſolido, priuſquam diviſor promoveatur. Quia enim diviſio debet fieri per 5L - 5c. Ideo quinq. cubi, qui de diviſore auferri non poſſunt, econtra ad numerum dividendum ſunt addendi. Item quia diviſio debet fieri per 5 + 1ß. Ideo unus ſolidus, qui ad diviſorem addi non poteſt, econtra de numero dividendo eſt ſubtrahendus.

EXEMPLVM.

Subtenſa X. gr. unde ſit extrahenda ſubtenſa duorum graduum.

S.			
C. 2c. S	C.		
·0 17 ·4 31	·1 4		
(5)(5)(5) 13	5. Adde	(003	
24 44	6 400 0		
	24 3	Subtr.	
24 44	6 375 7		
(5) 6	1 520 Adde	(4	
4 50	7 895 7	00 000	
	21 1	35 424	Subtr.

 (4)(5)0

(4)(5)0	7 874 5	64 576		(9		
(5)1	6 022 7	45 Adde				
2	3 897 3	09 576	000 00			
	6 3	40 413	767 49	Subtr.		
x	3 890 9	69 162	232 51	(04		
(5)	(5) 73 0	88 976	320 Adde			
	3 964 0	58 138	552 51	0 000 0	00 000	Subtr.
		29 677	769 34	9 411 0	73 024	
	3 964 0	28 460	783 16	0 588 9	26 976	
	(5)					(8 fere.

Quadrata particularia ſubtenſæ duorum graduum.

```
0 0.(3
00003
00009
-----------
00009 (4
    64
   256
-----------
0001156.(9
     689
    6201(0
-----------
  12180100.(4
      69804
     279216
-----------
  1218289216.(8
       698088
      5584704
-----------
  121834506304
```

Cubi

Cubi particulares ſubtenſæ duorum graduum.

C.0'000'027· Radix (3

12 304

C.0 000 039 304 (4

3 204. 549

C.0000042 508 549. (90

14 617 795. 264.

C.0000042 523 166 795. 264. (4

2 923 961 134 592

C.0000042 526. 090 756. 398 592. unus cubus (8

5. Multiplicator.

C.0000212. 630. 453. 781. 992. 960. Quinq; cubi.

Solidi particulares ſubtenſæ duorum graduum.

0°0000°000243· — — Radix (3

211 35424

454 35424 (4

63 40413. 76749

517 75837. 76749. (90

29677. 76934 94110. 73024

518 05515. 53683. 94110. 73024 (4

5937. 18660. 97927 80583 &c.

0°00000°00518 11452. 72344. 92038. 53607 (8

Examen factæ analyſeos per ſyntheſin contrariam.

1l. 00349048. Subtenſa 2.gr.

5l. 01745240

-- 5c. 00002126 Subtrahe

01743114

+ 1ſ. 000000051 &c. Adde: ſi quid ſit addendum.

01743114 Redit ſubtenſa 10 gr.

Cete-

Cæterum, quomodo cubi particulares investigandi sint, in exemplo problematis antecedentis monstratum fuit. Neq; hic quicquam novi est, nisi quod singuli cubi particulares multiplicantur per 5. priusquam addantur: quia quinq; cubi hîc ad numerum dividendum sunt addendi. v.g. primus cubus particularis in hoc exemplo fuit 27. Hic multiplicatus per 5 facit 135. Alter cubus particularis cum suis complementis fuit 12304. Hic numerus per 5 multiplicatus facit 61520. Et ita deinceps.

Solidos particulares sic invenies. Fit solidus multiplicatione cubi per quadratum: v.g. Solidus de 3 sic fit. ter tria sunt novem, ter 9 sunt 27. Novies 27 sunt 243. Atq; hæc est generatio solidi unius cyphræ: vel plurium etiam cyphrarum conjunctim consideratarum: ut solidus de 34 est 45435424. Nam quadratum de 34 est 1156. cubus 39304. Quæ duo inter se multiplicata efficiunt numerum 45435424. At, si singularum cyphrarum solidos cum suis complementis separatim inquirere velis, v.g. si post inventum solidum de 3, inquirere velis solidum de 4, qui cum suis complementis additus ad solidum de 3, efficiat solidum de 34, alia via opus est. Hâc nimirum: Solidus plurium cyphrarum v.g. solidus de 34. in cyphris omnibus post primam, habet quatuor complementa: ut sunt quatuor cyphræ inter singula quæq; puncta radicum solidarum interjecta. Illa quatuor complementa sic invenies. Pro primo complemento radicem præcedentem primo biquadrabis, deinde biquadratum quintuplabis, & quintuplatum per radicem præsentem multiplicabis. Pro secundo complemento radicem præcedentem cubabis, & cubatam decuplabis, & decuplatam per præsentis radicis quadratum multiplicabis. Pro tertio complemento præcedentem radicem quadrabis & quadratam decuplabis, & decuplatam per cubum præsentis radicis multiplicabis. Pro quarto complemento radicem præcedentem quintuplabis, & quintuplatam per biquadratum præsentis radicis multiplicabis. Inde præsentem etiam radicem solidabis. Ac deniq; hos quinq; numeros invicem addes: eo modo & ordine sub sese scriptos, ut subjectum exemplum ostendet.

Solidus

Solidus de 4 in l 3 4

	p̃c.l. 3	p̃c.l. 3	p̃c.l. 3	p̃cl. 3	l 4	
	q.9	99	99	5	16	
	bq.81	c 27				
	5	Dec. 270	Dec. 90	15	c. 64	
	405	q.16	C.64	bq256	64	
	l.4	1620	360	90	96	
I. Compl.	1620	270	540	75	1024	Sol.
II. Compl.	4320	4320	5760	30		
III Compl.	5760			3840		
IV.Compl.	3840					
Solidꝰ de 4	1024					

21135424 Solidus particularis de 4 cum suis complementis, respectu radicis antegressæ. 3.

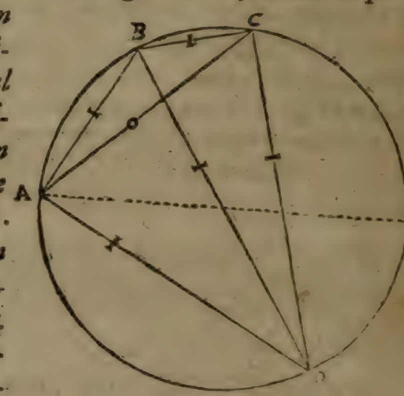
NOTA. *Eodem artificio septimæ, nonæ, undecimæ, decimætertiæ, & in infinitum cujuscunq; partis imparis subtensam invenire possis, si sit opus:*

XXXVII. PROBLEMA OCTAVVM. Datis sinibus duorum arcuum inæqualium, unà cum sinibus complementorum, sinum summæ vel differentiæ illorum arcuum invenire.

REGVLA. Multiplica alternatim sinum unius arcus per sinum complementi alterius: Producta si componas, & composita per radium dividas, hoc est, septem à dextra notas abscindas, habebis sinum summæ datorum arcuum. Si verò productum minus de majore subtrahas, habebis sinum differentiæ eorundem arcuum.

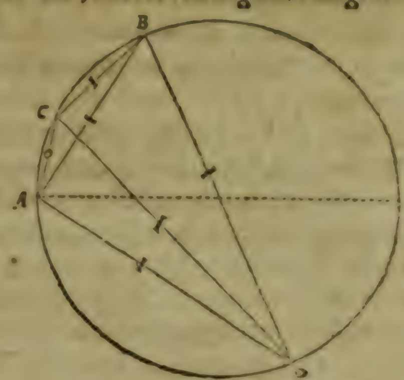
RATIO REGVLÆ. *Hæc regula habet duo membra. Vnum est de inventione sinus summæ duorum arcuum inæqualium. Alterum,*

de inventione sinus differentiæ duorum arcuum inæqualium. Inventio sinus summæ duorum arcuum inæqualium sic demonstratur. Totus circulus ◡ABCD, ponatur tantum 180 partium, ut omnes subtensæ sint instar sinuum. Et sint in eo circulo dati duo arcus inæquales ◡AB & BC, eorumq; complementa AD & CD. Et horum omnium sinus, nempe sinus arcus AB recta AB, sinus complementi AD recta AD. Sinus arcus BC recta BC, sinus cōplementi CD, recta CD: sinus autem summæ datorū duorum arcuum, nempe arcus AB & BC sit recta AC, quæ quæritur. Radius autē sit recta BD. Quia igitur sinus dicti hoc modo in circulum inscripti cōstituunt figuram quadrilaterā, diagoniis intersectam: in quali figura rectangulum diagoniorum est æquale duobus rectangulis binorum oppositorū laterum simul sumtis, per 54. primi: Ideo si sinum ◡AB, multiplices per sinum complementi arcus BC: nempe per latus oppositum CD, & vicissim sinum arcus BC per sinum complementi arcus ◡AB, nempe per oppositum latus ◡AD, eaq; duo producta conjungas, habebis rectangulum æquale rectangulo diagoniorum ◡AC & BD. Quod rectangulum si dividas per latus notum, nempe per radium BD, prodibit latus ignotum AC. Summa sinuum arcus AB & BC, sive sinus arcus AC. Quod demonstrandū erat.



Inventio sinus differentiæ duorum arcuum inæqualium ita demonstratur. Sit sinus arcus majoris AB, recta AB. Sinus arcus minoris BC recta BC. Sinus differentiæ ◡AC recta ◡AC. Sinus complementi arcus majoris AB recta AD. Sinus complementi arcus minoris BC recta CD. Radius BD. Quia igitur rursum figura ◡ACBD est figura quadrilatera, circulo inscripta & diagoniis intersecta: ideo si sinum arcus majoris ◡AB, nempe rectam ◡AB multiplicem per sinum complementi arcus mi-

cus minoris BC, nempe per rectam CD, habebo rectangulum diagoniorum, æquale duobus rectangulis binorum oppositorum laterum; Si igitur porrò multiplicem sinum arcus minoris BC, nempe rectam BC, per sinum complementi arcus majoris ◡AB, nempe per rectam ◡AD. Et hoc productum duorum oppositorum laterum BC, & ◡AD. auferam à rectangulo diagoniorum ◡AB & CD: restabit rectangulum laterum oppositorum ◡AC & BD. Quod rectangulum si dividam per latus notum BD: prodibit latus ignotum ◡AC, sinus differentiæ datorum duorum arcuum inæqualium ◡AB & BC. Quod & ipsum demonstrandum erat.



EXEMPLUM *utriusq; membri.*

Sint, arcus major AB 20. grad,
arcus minor BC 15. grad.
Summa horum arcuū erit 35. grad.
Differentia 5. grad.

Sinus datorum arcuum & complementorum sunt:

Sinus arcus AB. 3420201. Sinus compl. AD. 9396926.
Sinus arcus BC. 2588190. Sinus compl. CD. 9659258.

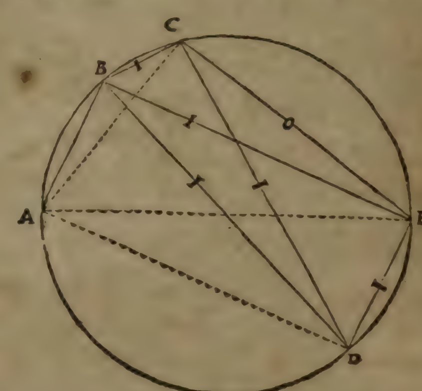
Multiplicentur igitur alternatim. Sinus arcus ◡AB per sinum complementi arcus BC, nempe per CD & sinus arcus BC per sinum complementi arcus ◡AB, nempe per ◡AD: erunt:

Productum majus	3303660	3870858
Productum minus	2432102	9905740
Summa, radio divisa.	5735763	*Sinus summæ 35. gr.*
Differentia, radio divisa.	871557	*Sinus differentiæ 5. gr.*

XXXVIII. PROBLEMA NONUM. Datis finibus duorum arcuum inæqualium, unà cum finibus complementorum, finum complementi summæ, vel differentiæ illorum arcuum invenire.

REGULA. Multiplica finum arcus unius per finum arcus alterius: Et finum etiam complementi arcus unius per finum complementi arcus alterius. Eo facto, si productum minus auferas à majore, & residuum radio dividas; habebis finum cōplementi summę datorum duorum arcuum. Si vero productū utrumq; componas, & cōpositum radio dividas; habebis finū complementi differentiæ datorum duorum arcuum.

RATIO REGULÆ. *Et hac regula habet duo membra. Primum sic demonstratur. Sit arcus majoris finus recta AB, vel illi æqualis DE, finus complementi, recta BE. Arcus minoris finus, recta BC, finus complementi recta CD, finus summæ, recta AC: finus complementi summæ, recta CE. Radius recta BD. Quia igitur figura BCED, est figura quadrilatera circulo inscripta & diagoniis intersecta: ideo si multiplicem finum complementi arcus AB, nempe rectam BE*

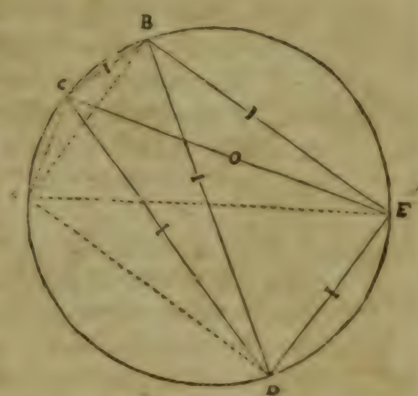


per finum complementi arcus BC, nempe per rectam CD: habebo rectangulum diagoniorum æquale duobus rectangulis binorum oppositorum laterum per 54 primi. Quod si ergo porrò multiplicem finum arcus BC per oppositum finum arcus DE, qui æquatur arcui AB: & hoc rectangulum subtraham à rectangulo diagoniorum: restabit rectangulum reliquorum duorum laterum oppositorū BD & CE, Quod rectangulum

gulum si dividam per latus notum, nempe per radium BD, prodibit latus ignotum CE, sinus complementi summæ datorum duorum arcuum ◡AB & BC. Quod demonstrandum erat.

Posterius membrum sic demonstratur.

Sit rursum arcus majoris sinus recta ◡AB vel ED, sinus complementi recta BE. ◡Arcus minoris sinus BC sinus complementi CD, Sinus differentiæ AC. Sinus cōplementi differentiæ CE, radius BD. Quia igitur figura CBED est figura quadrilatera circulo inscripta & diagoniis intersecta, ideo si bina quæq; latera opposita, nempe sinum BC per sinum DE; & sinum complementi BE per sinum complementi CD multiplicem, & producta componā, habebo rectangulum diagoniorum CE & BD. Quod si dividam



per latus notum, nempe per radium BD, prodibit latus ignotum CE, sinus complementi differentiæ datorum duorum arcuum ◡AB & BC, nempe sinus cōplementi arcus AC. Quod & ipsum demonstrandū erat.

Exemplum utriusq; membri.

Sint rursum,	*arcus major AB*	*20 gr.*
	arcus minor BC	*15 gr.*
	Summa	*35 gr.*
	Differentia	*5 gr.*

Sinus datorum arcuum & complementorum ſunt, ut ante.

Sinus AB. 3420201. Sinus AD vel BE 9396926

Sinus BC. 2588190. Sinus CD — 9659258

Multiplicentur AB per BC, & BE, per CD, & producta mutuo ſubtrahantur & componantur, radioq; dividantur: Et erunt:

Productum majus 9076733	*2640908*
Productum minus 885213	*0026190*
Differentia radio diviſa. 8191520	*Sinus complementi ſummæ.*
Summa radio diviſa. 9961946	*Sinus complementi differentiæ.*

XXXIX. Hæc novem problemata, ſunt quaſi inſtrumenta, quorum adminiculo ſinus reliqui omnes ex ſinu toto deducuntur. Ordo deductionis commodiſſimus hic eſt. Primum inquirantur ſubtenſæ arcuum 60. gr. 30. gr. 10. gr. 2. gr. 1. gr. 20′. 10′. 2′. 1′. 20″. 10″. 2″. per problemata quintum, ſextum & ſeptimum. Itemq; ſubtenſæ complementorum illorum arcuum per problema primum.

Nam iſta inquiſitio eſt omnium accuratiſſima: ut ſubtenſas illas jure principia Canonis Triangulorum appellare poſſis. Deinde ex ſemiſſibus illarum ſubtenſarum, hoc eſt, ex ſinibus arcuum 30. gr. 15. gr. 5. gr. 1. gr. 30′. 10′. 5′. 1′. 30″. 10″. 5″. 1″. unà cum ſinibus complementorum eorundem arcuum, facilè reliquos ſinus omnes deduces, per problema ſecundum, octavum & nonum Per problema ſecundum, ſinum duorum graduum; item duorum ſcrupulorum primorum ac duorum, vel 20. ſecundorum, indagando: per octavum & nonum, ſinibus hactenus inventis continuè ſinum unius gradus, vel unius primi, vel decem ſecundorum vel etiam unius ſecundi, addendo: prout canonem contractiorem vel ampliorem habere volueris.

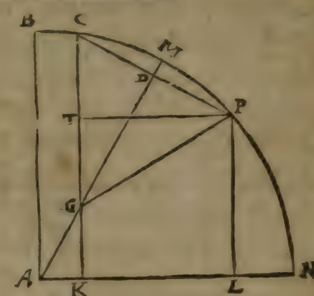
Ego dictas antea ſubtenſas graduum 60. 30. 15. &c. iſto quem notavi modo, inquiſivi in partibus radii 100000 00000 00000 00000 00000. Et ita inveni ut ſequitur.

Arcus

Arcus	Subtensæ				
60. Grad.	1 00000	00000	00000	00000	00000
30 0′ 0″	51763	80902	05041	52469	77977
10. 0. 0	17431	14854	95316	34711	61285
2. 0. 0	3490	48128	74567	02563	88379
1. 0. 0	1745	30709	96747	86992	97769
0. 20. 0	581	77559	68723	86884	86923
0. 10. 0	290	88810	61083	07015	25490
0. 2. 0	58	17764	09126	84919	27486
0. 1. 0	29	08882	07640	14734	29548
0. 0. 20	9	69627	36183	92296	70823
0. 0. 10	4	84813	68106	20557	04030
0. 0. 2		96962	73622	15273	56399
Semisses arcuum.	Semisses subtensarum.				
30. Grad.	50000	00000	00000	00000	00000
15 0′. 0″.	25881	90451	02520	76234	88988
5. 0. 0	8715	57427	47658	17355	80642
1. 0. 0	1745	24064	37283	51281	94189
0. 30. 0	872	65354	98373	93496	48884
0. 10. 0	290	88779	84361	93442	43461
0. 5. 0	145	44405	30541	53507	62745
0. 1. 0	29	08882	04563	42459	63743
0. 0. 30	14	54441	03820	07367	14774
0. 0. 10	4	84813	68091	96148	35411
0. 0. 5	2	42406	84053	10278	52015
0. 0. 1		48481	36811	07636	78199

XL. Com-

XL. *Compendium ſinuum inſigne eſt in hoc theoremate.* Differentia ſinuum arcuum duorum à ſexaginta gradibus hinc inde pariter diſtantium, eſt æqualis ſinui diſtantiæ.



DECLARATIO. *Sint duo arcus CN & PN à 60 gradibus MN, h.e. à puncto M hinc inde pariter diſtantes. Sintq; ſinus illorum arcuum, rectæ CK, & PL in rectam AB perpendiculares per 3. c. 7. hujus: ac proinde invicem parallelæ, per 38. p. 1. Porro in rectam CK ducatur normalis PT, parallela rectæ KL per 38. p. 1. Hæc, recta PL de recta CK abſcindet æqualem TK per 39. p. 1. & relinquet differentiam ſinuum CK & PL rectam TC. Sinus deniq; diſtantiæ alteriutrius à 60. gradibus ſit recta CD vel DP. Dico: rectam TC rectæ CD vel DP eſſe æqualem.*

DEMONSTRATIO. *Quia enim in Triangulo CGP perpendicularis GD biſecat baſin CP, per 7. hujus & per theſin. ideo latera GC & GP ſunt æqualia, per 23 p. 1. & anguli CGD & DGP iidem ſunt æquales, per eandem, & anguli deniq; GCP & GPC ſimiliter ſunt æquales, per 26. p. 1. Atqui angulus CGD eſt 30. partium: quippe æqualis angulo BAM, per 38 p. 1. Ergo angulus CGP eſt 60 partium: quippe ad angulum CGD duplus.*

Quia vero angulus CGP eſt 60 partium, ideo reliqui duo GCP, & GPC, ſimul ſumti, ſunt 120 partium, per 49. p. 1.

Atqui reliqui illi duo demonſtrati ſunt æquales. Ergo ſinguli eorum ſunt 60. partium.

Totidem autem partium erat etiam angulus CGP. Ergo Triangulum CGP eſt æquiangulum. Quia vero Triangulum CGP, eſt æquiangulum, ideo etiam eſt æquilaterum, per 28. p. 1.

Quia

Quia porro Triangulum CGP est aequilaterum, ideo perpendicularis PT bisecat basin CG per 23. p. 1.

Iam, latera CP & CG sunt aequalia.

Ergo etiam eorum bisegmenta CT & CD sunt aequalia. Quod demonstrandum erat.

CONSECTARIUM. *Datis igitur sinibus sexaginta quorumcunq. graduum, sinus reliquorum triginta graduum per solam vel additionem, vel subtractionem reperire licet.*

ILLUSTRATIO per numeros. *Sint arcus CN 70. PN 50. CM vel PM 10. graduum. Nam totidem gradibus arcus 70. & 50. graduum ab arcu 60. gra. hinc inde distant. Sintq. primum dati sinus 70. & 10. grad. Quaeratur autem sinus 50. grad.*

De sinu 70. gr. CK	—	9396926
Subtrahe sinum 10. gr. CD vel CT	—	1736482
Et relinquetur sinus 50 gr. TK vel PL		7660444

Sint deinde dati sinus 70. & 50 graduum.

Quaeratur autem sinus 10. graduum.

De sinu 70. gr. CK	—	9396926
Subtrahe sinum 50. gr. TK vel PL	—	7660444
Et relinquetur sinus 10. gr. TC vel CD		1736482

Sint denique dati sinus 50. & 10 grad.

Ad sinum 50. grad. PL vel TK	— —	7660444
Adde sinum 10. gr. DP vel TC	—	1736482
Et fiet sinus 70. grad. CK	— —	9396926

XLI. Atque haec de condendis tabulis sinuum rectorum. Tabulis sinuum versorum non est opus: ut supra diximus.

XLII. Tabulae tangentium & secantium ex tabulis sinuum rectorum ita deducuntur.

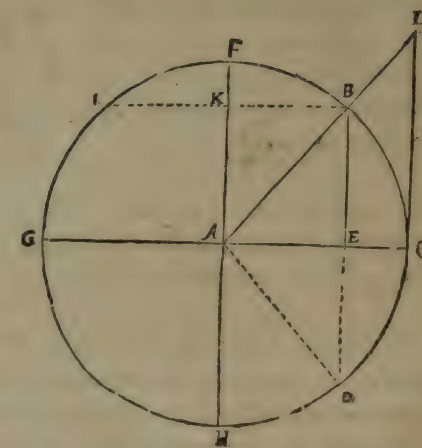
I. Vt sinus complementi ad sinum arcus: ita radius ad tangentem arcus.

II. Vt sinus complementi ad radium: ita radius ad secantem arcus.

Nam per 46.pr.1.

I. Vt AE ad EB. ita AC ad CL.

II. Vt ⌣AE ad ⌣AB, ita ⌣AC ad ⌣AL.



Exempli gratia, quærantur tangens & secans arcus BC. 30.gr.

Sinus 30.gr. est 5000000. BE.

Sinus comple. 60.gr. est 8660254. ⌣AE.

Dico igitur

I. Vt ⌣AE 8660254 ad BE 5000000, ita ⌣AC. 10000000 ad CL 5773503.

Ergo tangens arcus 30. grad. est 5773503.

II. Vt ⌣AE 8660254. ad ⌣AB 10000000, ita ⌣AC. 10000000 ad ⌣AL. 11547005.

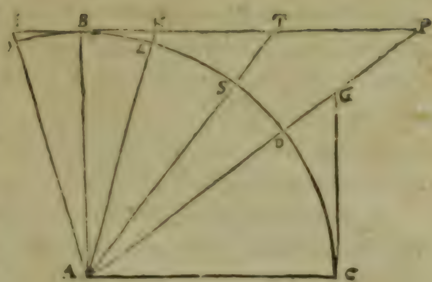
Ergo secans arcus 30.gr. est 11547005.

XLIII. *Compendia tangentium & secantium egregia sunt in sequentibus tribus Theorematibus.*

THEOREMA PRIMUM. Differentia tangentium duorum arcuum, quadrantem simul adimplentium, est dupla ad tangentem differentiæ arcuum.

DECLARATIO. *Sint duo arcus, quadrantem simul adimplentes, CD & BD, eorumq; tangentes CG & BP. Et arcui CD, statuatur æqualis arcus BS, unde apparebit differentia datorum arcuum CD vel BS &*

BS & BD arcus SD. Tangenti item CG statuatur aequalis tangens BT, unde apparebit differentia datarum tangentium CG vel BT & BP recta TP. Arcui denique SD statuantur aequales arcus BL & BO, quorum arcuum tangentes sint BK & BM. Dico rectam TP, differentiam nempe datarum duarum tangentium CG & BP, esse duplam ad rectam BK, tangentem differentiae datorum duorum arcuum. Vel quod idem est: dico, rectam TP esse aequalem rectae MK.



DEMONSTRATIO. *Si enim ab aequalibus auferas aequalia, quae restant sunt aequalia.*

Atqui rectae KP & MT sunt aequales.

Ergo si ab utraque auferas rectam KT, quae restabunt rectae TP, & MK aequales erunt.

Assumtio probatur. Nam quae eidem sunt aequalia: etiam inter sese sunt aequalia.

Atqui rectae KP & MT, eidem rectae KA, sunt aequales.

Ergo etiam inter sese sunt aequales.

Assumtio rursum probatur. Ac primum: quod recta KP sit aequalis rectae KA sic probatur.

Quia in Triangulo AKP anguli KAP & KPA sunt aequales.

Ergo etiam latera ipsis opposita, nempe latera KA & KP sunt aequalia, per 5. p. 1.

Quod autem anguli KAP & KPA inter se sint aequales: inde patet, quia eidem angulo DAC, sunt aequales.

Nam angulus KPA est aequalis angulo DAC, per 38 p. 1. Angulus vero KAP est aequalis eidem angulo DAC, per structuram. Arcus n. BL positus

est æqualis arcui SD differentiæ arcuum DC & BD. Angulus igitur BAL vel BAK est differentia inter angulos BAP & DAC. Cum igitur anguli KAP & KPA eidem angulo DAC sint æquales: etiam inter sese æquales esse necesse est.

Deinde quod recta MT sit æqualis rectæ KA, sive per structuram rectæ MA, sic probatur.

Quia in Triangulo AMT anguli MTA & MAT, sunt æquales, ergo etiam latera ipsis opposita, nempe latera MT & MA sunt æqualia, per 5. p. 1. Quod autem anguli MTA & MAT, sint æquales, inde patet. Quia angulus MTA est æqualis angulo TAC, per 38. p. 1. Angulus autem TAC est æqualis angulo TAM per structuram. Arcus enim CS & SO positi sunt æquales. Eadem est ratio, si differentia BL, sit major dimidio complemento BS. Tantum literæ L & S, item K & T transponuntur. In genere igitur differentia tangentium duorum arcuum quadrantem simul adimplentium, est dupla ad tangentem differentiæ arcuum. Quod demonstrandum erat.

CONSECTARIUM. Datis igitur tangentibus duorum arcuum, quadrantem simul adimplementium, datur etiam tangens differentiæ duorum illorum arcuum. *Et contra*: Data tangente differentiæ hujusmodi duorum arcuum, unà cum tangente arcus alterutrius, datur etiã tangens arcus alterius.

APPENDIX.

Hoc theorema etiam sic proponi potest. Dupla tangens arcus, cum tangente dimidii complementi, est æqualis tangenti arcus ex arcu dato & dimidio ejus complemento compositi.

Nam, si pro arcu dato habeatur arcus BL, dupla ejus tangens erit TP, per demonstrationem antecedentem: Complementum verò arcus BL, erit arcus LC, cujus dimidium est arcus LD, vel DC, cujus tangens est recta GC vel BT. Atqui TP, conjuncta cum BT efficit BP, tangentem

gentem arcus BD, ex arcu dato BL & dimidio complemento LD compositi: Ergo, &c.

XLIV. THEOREMA SECUNDUM. Tangens differentiæ duorum arcuum, quadrantem ſimul adimplentium, cum tangente arcus minoris, conſtituit ſecantem differentiæ.

Vt tangens differentiæ BL vel BO, nempe recta BK vel BM, cum tangente arcus minoris DC vel BS, hoc eſt, cum recta BT, conſtituit rectam MT, quæ eſt æqualis rectæ AK, ſecanti differentiæ BL, per primi theorematis demonſtrationem.

CONSECTARIUM. Data igitur tangente differentiæ duorum arcuum quadrantem ſimul adimplentium, & tangente arcus minoris, datur etiam ſecans differentiæ. *Et contra, &c.*

APPENDIX.

Hoc theorema etiam ſic proponi poteſt. Tangens arcus cum tangente dimidii complementi eſt æqualis ſecanti arcus. *Nam ſi pro arcu dato habeas arcum BL & BO, tangens arcus dati erit BM: tangens dimidii complementi erit BT, quæ duo tangentes ſimul ſumtæ, componunt rectam MT. Atqui recta MT æquatur rectæ AK per primi theorematis demonſtrationem, Quæ recta AK eſt ſecans arcus dati BL, per ſtructuram. Ergo, &c.*

XLV. THEOREMA TERTIUM. Tangens differentiæ duorum arcuum quadrantem ſimul adimplentium, cum ſecante ejuſdem differentiæ, eſt æqualis tangenti arcus majoris.

Vt tangens arcus BL, differentiæ duorum arcuum quadrantem ſimul adimplentium BD & DC, cum ſecante ejuſdem arcus BL, hoc eſt,

recta BK, cum recta AK, est æqualis rectæ BP. Per demonstrationem primi problematis.

CONSECTARIUM. Data igitur tangente differentiæ duorum arcuum Quadrantē simul adimplentiū cum secante ejusdem differentiæ datur tangens majoris arcus: *& contra, &c.*

APPENDIX.

Hoc theorema etiam sic proponi potest. Tangens arcus, cum secante ejusdem, est æqualis tangenti arcus ex arcu dato & dimidio complemento compositi.

Nam, si pro arcu dato habeas arcum BL, tangens arcus dati erit BK, secans AK. Atqui rectæ AK, & KP æquantur: Per primi theorematis demonstrationem. Ergo tangens arcus dati BL nempe recta BK, cum secante ejusdem arcus, AK, est æqualis recta BP, quæ est tangens arcus BD, ex arcu dato BL & dimidio complemento LD, compositi.

XLVI. Exempla præcedentium trium theorematum habes in subjecta tabella.

Tangens

	Tangẽs 3″0. 1454		
8 9. 5 9	34377466738	34377468192	
1	2909		
	34377463829	4	Ex ſubtr.
8 9. 5 8	17188731914	17188734823	Ex add.
2	5818		
	17188726096		
8 9. 5 6	8594363048	8594368866	
4	11635		
	8594351413	2	Ex ſubtr.
8 9. 5 2	4297175706	4297187341	Ex add.
8	23271		
	4297152435	9	Ex ſubtr.
8 9. 4 4	2148576217	2148599488	Ex add.
16	46542		
	2148529675	80	Ex ſubtr.
8 9. 2 8	1074264837	1074311379	Ex add.
32	93087		
	1074171750		
8 8. 5 6	537085875	537178962	
1. 4	186190		
	536899685	3	Ex ſubtr.
8 7. 5 2	268449842	268636032	Ex add.
2. 8	372509		
	268077333	6	Ex ſubtr.
8 5. 4 4	134038666	134411175	Ex add.
4. 16	746053		
	133292613	60	Ex ſubtr.
8 1. 2 8	66646306	67392359	Ex add.
8. 32	1500458		
	65145848		
7 2. 5 6	32572924	34073382	
1 7. 4	3070034		
	29502890		
5 5. 5 2	14751445	17821479	
3 4. 8	6778997		
	7972448		
2 1. 4 4	3986224	10765221	
6 8. 1 6			

In qua

In qua tabella, primum datis tangentibus duorum arcuum, quadrantem simul adimplentium, nempe arcus 8 gr. 9.59'. & arcus 1'. investigata est tangens differentiæ 8. gr. 9.58'. Et porro ex data hac tangente atq; tangente arcus quadrantem complentis 2'. investigata est tangens differentiæ 8. gr. 9.56'. Atq; ita deinceps, usq; dum complementum subscriptum ab arcu suprascripto amplius subtrahi non potuit, quod factum est ad arcum 2. gr. 1.44'. cujus complementum est 6. gr. 8. 16'. quod ab arcu 2. gr. 1. 4'4. subtrahi non potest. Sic inquam tangentes omnes inquisitæ sunt per theorema primum. Deinde secantes arcuum eorundem præter primam omnes inquisitæ sunt, continuè addendo tangentem differentiæ ad tangentem arcus minoris, per theorema secundum: vel subtrahendo tangentem differentiæ à tangente arcus majoris, per theorema tertium. Prima autem secans inquisita est, ad tangentem arcus dati 8. gr. 9. 1'. addendo tangentem dimidii complementi, nempe 30. secundorum, per theorema secundum.

Quod si extra hanc exemplorum continuationem, v. g. ex data tangente arcus 21. grad. 44'. & dimidii complementi 34. gr. 8. min. inquirenda fuisset tangens arcus, ex dato arcu 21. grad. 44'. & dimidio complemento 34. grad. 8'. compositi, nempe arcus. 55. gr. 52'. adhibenda fuisset appendix primi theorematis.

Si verò ex datis iisdem tangentibus, arcus, 21. gr. 44'. & dimidii complementi 34. gr. 8'. inquirenda fuisset secans arcus 21. gr. 44'. adhibenda fuisset appendix secundi theorematis.

Si deniq; ex tangente & secante arcus 21. gr. 44'. inquirenda fuisset tangens arcus ex arcu dato 21. gr. 44'. & dimidio complemento 34. gr. 8'. compositi, nempe arcus 55. grad. 52. adhibenda fuisset appendix tertii theorematis.

XLVII. Atq; hæc de constructione Canonis. Examen Canonis jam constructi fieri potest variis modis: nempe vel per ha-

per hactenus explicata construendi canonis præcepta, & cõpendia: vel per differentias sinuum, tangentium & secantium primas, secundas, tertias, &c.

XLVIII. Quocunq; autem modo examen illud instituatur, fieri potest, ut numerus aliquis in fine falsus esse videatur, qui tamen falsus non sit. *Vt, si sequentes tangentes examines per 41. p. hujus: hoc modo.*

77.gr.29.prim.Tangens.	45045072.
12.gr.31.prim.Tangens.	2219999.
	42825073.
64.gr.58.prim.Tangens.	21412536.

Vltima Tangens 21412530. quoad ultimam notam non respondebit tangenti in Canone positæ. Nam ibi ultimo loco est 7. Et tamen nullus error in his tribus tangentibus inest. Causa autem cur tangens 21412536 per hoc examen proveniat justo minor, hæc est: quia tangens 2219999. fuit justo maior. Nimium igitur subtraxit à tangente 45045072. Quod si ponas pro tangente 2219999. tangentem 2219998. erit hæc justo minor. Vltima autem tangens 21412537. proveniet justo major. Ob talem igitur discrepantiam, quæ evitari nullo modo potest, nullus Canon est erroris arguendus.

XLIX. In reliquis notis, præter ultimam, si quis error insit, per differentias primas, secundas, tertias, &c. facilimè deprehendi potest. *Sit forte in Canone Tangens 77.gr.20.prim. ita posita. 44494381. & sit suspicio, inesse illi aliquem errorem. Pone ordine aliquot tangentes, cum suis differentiis primis, secundis, tertiis: hoc modo:*

12 Grad.	Tang.	Differ. I.	Differ. II.	Differ. III.	
31 prim.	45045072				29
32 —	44983221	61851			28
33 —	44921532	61689	162		27
34 —	44860004	61528	161	1	26
35 —	44798636	61368	160	1	25
36 —	44737428	61208	160	0	24
37 —	44676379	61049	159	1	23
38 —	44615489	60890	159	0	22
39 —	44554756	60733	157	2	21
40 —	44494381	60375	358	0—1	20
41 —	44433762	60619	-56	2	19
42 —	44373499	60263	356	0	18
43 —	44313392	60107	156	0	17 prim.
					77 Grad.

Statim videbis, vel ex differentiis primis, vel certè ex secundis, numerum 44494381. tertio à dextris loco falsum esse, quia in differentiis secundis post 157. sequitur 358. quod non potest non esse falsum. Igitur pro 358. pone 158. Et 158. subtrahe de differentia prima proximè antecedente 60733. & restabit differentia prima subsequens 60575. quam si subtraxeris de tangente antecedente 44554756. restabit tangens desiderata 44494181. Et sic error emendatus erit: numeriq; ita sese invicem comsequentur.

39	44554756	60733	157	2
40	44494181	60575	158	0—1
41	44433762	60419	156	2
42	44373499	60263	156	0
43	44313392	60107	156	0

L. Dispositio Canonis aliis alia placet. Nobis ea visa est commodissima, quam vides. In qua sinus tangentes & secantes arcuum semiquadrante minorum in facie sinistra: Sinus vero tangentes & secantes arcuum semiquadrante majorum in dextra facie Canonis collocatæ sunt: ut sive arcus semiquadran-

quadrante minor ſive major in quæſtionem veniat, ejus complementum è regione ſtatim ſeſe offerat. Et ſinus quidem tangentes ac ſecantes arcuum ſemiquadrante minorum, unà cum arcubus ſuis creſcunt deſcendendo: Sinus vero tangentes & ſecantes arcuum ſemiquadrante majorum unà cum arcubus ſuis creſcunt aſcendendo, per ſingula ſcrupula prima: excepto primo gradu, ejuſque complemento: ubi etjam ſcrupula ſecunda, vel ſingula, vel bina, vel dena adhibuimus: quia aliter calculus in ſcrupulis ſecundis infallibilis ibi haberi nequit.

Loco differentiarum poſuimus partem proportionalem, vel ſingulorum, vel denorum ſecundorum: compendioſioris calculi gratia. Addidimus etiam incrementa, quibus partes proportionales inæquales, vel per ſingula, vel per dena ſcrupula ſecunda creſcerent; ad majorem præciſionem aſſequendam.

Radium aſſumſimus pro neceſſitate varium. Nempe, vel quinq;, vel ſeptem, vel octo, vel novem, vel decem, vel undecim, vel etiam duodecim notarum. Quam varietatem prudens logiſta facilè conciliabit: ſemper tantæ magnitudinis radium ad calculum adhibendo, ad quantæ magnitudinis radium quilibet in canone numerus factus ſit. Quod ut ſtatim appareat, ſinus tangentes & ſecantes ad radium 100000. factos, à cæteris, quàm pro iſto radio majoribus puncto interjecto ubiq; diſcrevimus. Imò, ubi pluſquam decem notarum eſt radius, etiam alterum punctum interjecimus: quo ſinus tangentes & ſecantes radii decem notarum à ſinibus tangentibus & ſecantibus majoribus è veſtigio diſcerni dignoſcique poſſent. Ubi nullus numerus poſt punctum apparet, ibi radius tantum eſt quinque notarum. (100000.) ut in omnibus tangentibus & ſecantibus poſtremorum quinq; graduum.

LI. Usus Canonis in genere hic est, ut uniuscujusq; arcus, vel anguli dati, (modo 90. gradus non excedat) Sinum tangentem & secantem, unà cum sinu tangente & secante complementi: aut contrà, uniuscuiusque sinus tangentis, aut secantis datæ arcum inde promptè excerpere, & sic in calculo triangulorum sine remora progredi possis.

Vt, si arcus, vel anguli 30. graduum, vel ejus complementi quaratur sinus tangens, secans, dabuntur ista omnia de Canone sic, ad radium 10000000.

Arcus 30. grad.		*Complementi.*	
Sinus.	5000000.	*Sinus.*	8660254.
Tangens.	5773503.	*Tangens.*	17320508.
Secans.	11547005.	*Secans.*	20000000.

Contra:

Si data tangente 5773503. quæratur, quantus arcus, vel angulus illi competat, respondebit Canon, competere illi tangenti arcum, vel angulum 30. gr. Et simul in altero Canonis margine ostendet hujus arcus, vel anguli complementum esse arcum, vel angulum 60. graduum.

LII. Quod si fortè scrupula secunda primis adhæserint, & illa etiam ad calculum adhibere libeat, ita procedes, ut sequentia exempla te docebunt.

Exemplum primum. Sit inquirendus sinus 12. gr. 6. prim. 23. sec. Sume initio de tabulis sinum 12. gr. 6. prim, qui est 2096186. Deinde per partem proportionalem collige, quantum reliquis 23. secundis competat, dicendo:

10″. *dant* 474 *particulas: quid dant* 23″?

```
        23
   ------------
       1422
       948
   ------------
   Rx  1090|2
```

Deniq;

Deniq; ad prim datum Sinum	—	2096186
Adde partem proportionalem jam inventam		1090
Et habebis Sinum desideratum	—	2097276

Secundum Exemplum. Sit inquirenda tangens arcus 88. gr. 51 primorum, 34. secundorum. Principio desumes ex tabulis tangentem 88. gr. 51. prim. quæ tangens ad radium 100000. est 4981573. Deinde partem proportionalem 34. secundorum ita colliges.

PP. 10. *secundorum.*	—	12065. A.	
Incrementum	—	59	*Hoc adde continue, primum ad A. deinde ad B. tertio ad C. & habebis A, B. C. pro 30. secundis. D. verò si multiplicaveris per 4. & ultimam notam abscideris, habebis 4897. pro reliquis 4 secundis. Iam adde A, B, C, E, & invenies F.*
10. *secund.*	—	12124. B.	
10. *secund.*	—	12183. C.	
10. *secund.*	—	12242. D.	
4. *secund.*	— —	4897. E	
34. *secund.*	—	41269 F.	
Ad F. adde tangentem		4981573	
Et habebis tangentem desideratam		5022842	

Tertium Exemplum. Sit inquirenda tangens 89. gr. 39. prim. 24. sec. Procede sic.

Tangens 89. gr. 39. prim. 20 sec.		16634058. A.	
	1. *sec.*	13452. B	
	Incrementum.	22	*Hoc adde continue ad B, C & D. ut invenias C, D & E. Deniq; in unam summam collige ABCDE.*
	1 *sec.*	13447. C.	
	1. *sec.*	13469. D	
	1 *sec.*	13491. E.	
Et habebis tangentem desideratam		16687890	

Vel brevius. Multiplica partem proportionalem unius secundi per 4. & incrementum per tot unitates, quot sunt in progressione quatuor locorum: hoc est, per 6. (Nam talis est quatuor locorum progressio. 0. 1. 2. 3. in qua progressione sunt 6. unitates) & habebis eandem tangentem hoc modo:

Tangens.	—	16634058. *A.*
PP. 1. *sec.*	— —	~~13425~~ *multiplica per* 4.
		53700 *B.*
Incrementum.	— —	~~22~~ *multiplica per* 6.
		132. C. *Adde A, B, & C. Et habebis*
Tangentem desideratam	—	16687890. *ad radium* 100000.

LIII. Sin contrà datus sit aliquis sinus, aut tangens, aut secans, cujus arcum etiam in scrupulis secundis præcise colligere volueris: sic procedes, ut sequentia exempla te docebunt.

Primum Exemplum. Sit datus sinus 2097276. *ad radium* 10000000. *Quæratur autem quantus ei arcus competat.*

Principio inquires in tabulis sinum proximè minorem, & eum à sinu dato subtrahes, & arcum ipsi competentem annotabis.

Deinde ex residuo scrupula secunda colliges hoc modo:

Sinus datus.	— —	2097276	
Sinus proximè minor	—	2096186	*Arcus* 12. *gr* 6.
		1090. *Residuum.*	
		474. PP. 10. *Sec. in tabulis.*	

Iam, 474. *partes dant* 10. *secunda, quid dant* 1090. *partes?*

10900
474 (2
948   Rx. 23. *ferè.*
1420 (3. *ferè*
474
1422

Ergo arcus quæsitus est 12. *gr.* 6. *prim.* 23. *sec.*

Secundum Exemplum. Sit data tangens 5022839. *ad radium* 100000. *quæratur autem arcus illi competens. Primò rursum inquires in tabulis tangentem proximè minorem, & arcum ei competentem.*

Tum

Tùm subtrahes tangentem istam minorem à tangente data: & ex residuo scrupula secunda colliges hoc modo:

Tangens data	—		5022839.
Tangens proxime minor	—		4981573. *Arcus* 88.*gr*.51'.
			41266. *residuum.*
			12065 (10. *sec.*
10''	—	12065	29201. *residuum.*
Increm.	—	59	12124. (10. *sec.*
10''	—	12124	17077. *residuum.*
10	—	12183	12183 (10. *sec.*
10	—	12242	4894. *residuum.*
1''	—	1224	1224. (1. *sec. Iam* 1224. *in* 4894. *habetur quater fere. Nam quater* 1224 *facit* 4896.
			4896.

Ergo arcus datæ tangenti competens est 88 grad.51'.34''.

Tertium Exemplum. Sit data tangens 16687890. ad radium 100000. *Quæratur autem, quantus illi arcus competat. Procedes hoc modo:*

Tangens data	—	16687890.
Tangens proxime minor	—	16634058. *Arcus* 89.*gr*.39'.20''.
Residuum	—	53832.
PP.*unius sec.*	—	13425.*A*
Incrementum	—	22. *Hoc adde ad A, & B, & C.*
		13447.B.
		13469 C.
		13491.D *Iam adde A, B, C, & D.*
Fit	—	53832. *pro* 4. *secundis.*

Ergo arcus tangenti data competens est 89.gr.39'.24.

LIV. Hoc

LIV. Hoc modo per Canonem iſtum ad ſingula ſcrupula ſecunda abſque omni errore in calculo trigonometrico pervenire poteris. Et in primo quidem ac poſtremo gradu certius, quàm per magnum Canonem Rhetici: In cæteris verò omnibus, Canon Rhetici præſtat. Nam & citius per illum operari: & non tantum ſcrupula ſecunda: verum etiam tertia & quarta, ex illo infallibiliter colligere poteris.

Itaque ſi ſapies & tantum æris habebis,
iſtum Canonem omnino tibi
comparabis.

BAR-

BARTHOLOMÆI
Pitisci Grunbergensis

TRIGONOMETRIÆ

Liber Tertius.

De dimensione Triangulorum planorum.

Hactenus de principiis Trigonometriæ, & de tabulis Sinuum, Tangentium & Secantium, ad Trigonometriam exercendam necessariis. Nunc sequitur ipsa illa Trigonometria, sive dimensio Triangulorum, tàm planorum, quam Sphæricorum. In qua utraque explicanda: quia non aliter, quàm per regulam proportionum absolvitur: ut supra dictum fuit: principiò quidem axiomata quædam trademus, ex quibus intelligatur, quæ proportiones quibus Triangulis, Triangulorumve partibus insint: quæ axiomata idcirco Axiomata Proportionum appellare libet. Deinde verò ostendemus, quomodo axiomata illa ad usum applicari debeant, sive, quomodo beneficio paucorum illorum axiomatum quodlibet quæsitum, in quovis Triangulo proposito, ex quibusvis tribus datis, quàm citissimè reperiri possit.

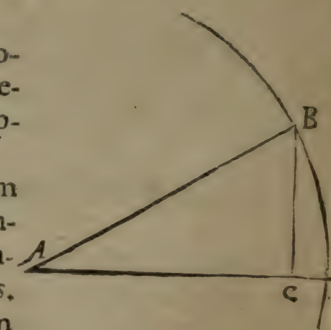
Axiomata proportionum in Triangulis planis existentium præcipua, & ad omnem eorum solutionem abunde sufficientia, præter aureum illud totius trigonometriæ fundamentum, quod libro primo, propositione 46. explicavimus, sunt quatuor.

AXIOMA PRIMUM.

In triangulis planis rectangulis:

Unumquodque latus pro radio poni poteſt, ad canonem triangulorum convenienter.

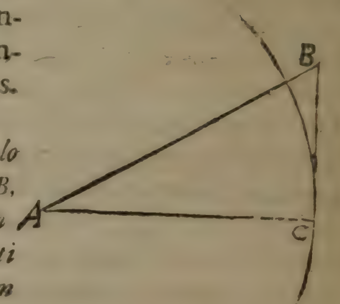
Nam



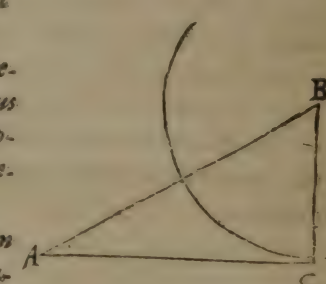
Si latus ſubtendens rectum ponas pro radio: latera includentia rectum ſunt ſinus acutorum ipſis oppoſitorum.

Si majus includentium rectum ponas pro radio: minus includentium rectum eſt tangens; ſubtendens rectum, ſecans; acuti minoris.

Si minus includentium rectum ponas pro radio, majus includentium rectum eſt tangens; ſubtendens rectum, ſecans; acuti majoris.



Vt in triangulo plano rectangulo ABC: Si latus ſubtendens rectum ◡AB, ponas pro radio: latus minus includentium rectum BC, eſt ſinus oppoſiti acuti minoris BAC: latus majus includentium rectum ◡AC, eſt ſinus oppoſiti acuti majoris ◡ABC.



Si verò latus maius includentium rectum ◡AC, ponas pro radio: latus minus includentium rectum BC, eſt tangens oppoſiti acuti minoris BAC: ſubtendens rectum ◡AB, eſt ejuſdem acuti ſecans.

Si deniq; latus minus includentium rectum BC, ponas pro radio: latus ma-

jus in-

jus includentium rectum ◡AC, est tangens oppositi acuti majoris ABC: subtendens rectum ◡AB, est ejusdem acuti secans.

Omnia per definitiones sinuum tangentium & secantium, libro secundo traditas.

Consectarium primum.

Itaq. in triangulis planis rectangulis:

Datis angulis datur ratio laterum tripliciter: *Et per consequens,*

Dato præter angulos unico latere, datur reliquorum laterum quodlibet triplici proportione: *prout scilicet, vel hoc, vel illud, vel tertium latus pro radio posueris.*

Vt, in triangulo plano rectangulo proposito ◡ABC. Datis angulis, ad ◡A, 30. gr. 20. sc. atq. adeo ad B, 59. gr. 40. (Nam alter acutorum est alterius complementum, per 52. p. 1. Itaq. in triangulis planis rectangulis, dato unico acutorum, omnes anguli dati sunt) Datis inquam angulis ad A, 30. gr. 20'. & ad B, 59. gr. 40'. datur ratio laterum.

Vel sic:

AB, radius	10000000
BC, sinus acuti BAC	5050298
AC. sinus acuti ABC	8631019.

Vel sic:

AC, radius	10000000
BC, tangens acuti BAC	5851335
AB, secans ejusdem acuti	11586118.

Vel deniq. sic:

BC, radius	10000000
AC, tangens acuti ABC	17090116
AB, secans eiusdem acuti	19800810.

Hoc est:

Ostenditur per canonem triangulorum, quod latus ◡AB, verbi gratiá, sese habeat ad latus BC,

Vel:

Vt AB, 10000000 *ad BC,* 5050298.

Vel:

Vt AB, 11586118 *ad BC,* 5851335.

Vel deniq;:

Vt AB. 19800810 *ad BC.* 10000000. *Et sic de cæteris.*

Dato igitur, præter angulos hoc modo datos, latere AB, 24 pedum: si quæratur latus BC, quot pedum? dixero.

Vel:

Vt AB, radius 10000000 *ad BC, sin.* 5050298.
ita AB, latus 24. *ped. ad* BC $12\frac{1207152}{10000000}$ *ped.*

Vel:

Vt AB, secans 11586118 *ad BC, tang.* 5851335.
ita AB, latus 24. *ped. ad* BC $12\frac{1398624}{11586118}$ *ped.*

Vel deniq;:

Vt AB, secans compl. 19800810 *ad BC rad.* 10000000.
ita AB, latus 24. *ped. ad* BC $12\frac{2390280}{19800810}$ *ped.*

Sic, si dato eodem latere AB, 24. ped. quæratur latus AC, quot pedum? dixero.

Vel:

Vt AB, radius 10000000 *ad AC, sin.* 8631019.
ita AB, latus 24. *ped. ad AC* $20\frac{7144456}{10000000}$ *ped.*

Vel:

Vt AB, secans 11586118. *ad AC, rad.* 10000000.
ita AB, latus 24. *ped. ad AC* $20\frac{8277640}{11586118}$ *ped.*

Vel deniq;:

Vt AB, secans compl. 19800810 *ad AC, tang* 17090116.
ita AB, 24. *ped. ad AC,* $20\frac{14146584}{19800810}$ *ped.*

¶ Sic si dato latere AC, $20\frac{7144456}{10000000}$ pedum, quæratur latus BC, quot pedum? dixero.

Vel:

Vel:

*Vt AC,sin.*8631019.*ad BC,sin.*5050298.
*ita AC,*20$\frac{7144456}{10000000}$*ped. ad BC,* 12$\frac{1041895}{8631019}$*ped.*

Vel:

Vt AC,radius 10000000 *ad BC,tang.* 5851335.
*ita AC,*20$\frac{7144456}{10000000}$*ped.ad BC,* 12$\frac{1357150}{10000000}$*ped.*

Vel deniq;:

*Vt AC,tangens compl.*17090116.*ad BC,rad.*10000000.
*ita AC,*20$\frac{7144456}{10000000}$*ped.ad BC,* 12$\frac{2065305+}{17090116}$*ped.*

Prudens autem logista in serio trigonometriæ usu semper eam proportionem ad calculum adhibebit, quæ habeat radium primo loco: ad molestum divisionis laborem evitandum.

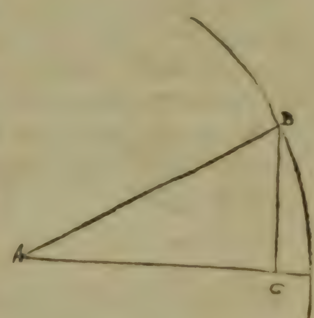
Consectarium secundum.

Datis duobus quibuscunq; lateribus, datur uterque acutorum, duplici proportione: prout scilicet vel hoc vel illud datorum duorum laterum pro radio posueris.

Vt, in triangulo plano rectangulo ◡*ABC. Si dentur duo latera rectū non includentia,* ◡*AB, & BC: illud* 5. *hoc* 3. *pedum: quærantur autem acuti ad* ◡*A & B, dixero,*

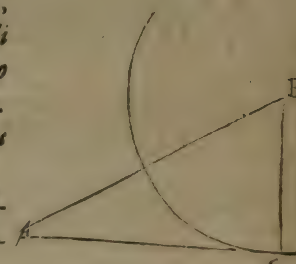
Vel:

Vt ◡*AB,* 5. *ped. ad BC,* 3. *ped. ita* ◡*AB, rad.* 10000000 *ad BC, sinum anguli BAC,* 6000000, *cui sinui in sinistro canonis margine respondet angulus BAC,* 36. *grad.* 52. 12. *& in dextro margine sinus complementi* ◡*ABC,* 53 *gr.* 7′. 49″.



Vel:

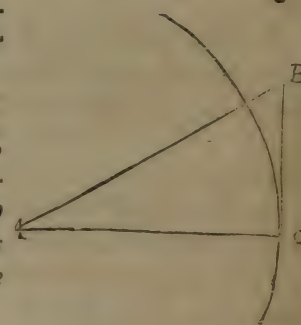
Vt BC, 3. ped. ad ◡AB, 5. ped. ita BC, rad. 10000000. ad ◡AB, secantem anguli ◡ABC, 16666666, cui secanti in dextro canonis margine respondet angulus 53. gr. 7'. 48''. & in sinistro margine angulus complementi 36. gr. 52'. 12''.



¶ *Sic, in eodem triangulo plano rectangulo ◡ABC. Si dentur duo latera circa rectum ◡AC, & BC, illud 4. hoc 3. pedum: quærantur autem acuti ad ◡A & B. dixero.*

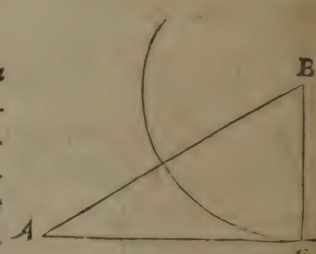
Vel:

Vt ◡AC, 4. ped. ad BC, 3. ped. ita AC, radius 10000000. ad BC, tangentem anguli BAC, 7500000, cui tangenti in sinistro Canonis margine respondet angulus BAC, 36. gr. 52'. 12''. Et in dextro margine angulus complementi 53. gr. 7'. 48''.



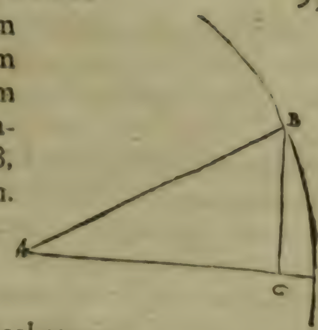
Vel:

Vt BC, 3. ped. ad ◡AC, 4. ped. ita BC, radius 10000000. ad ◡AC, tangentem anguli ◡ABC, 13333333. Cui tangenti in dextro Canonis margine respondet angulus ◡ABC, 53. gr. 7'. 48''. Et in sinistro margine angulus complementi 36. grad. 52'. 12''.



NOTA. Antequam tabulæ tangentium repertæ essent, datis duobus lateribus circa rectum, anguli acuti cum latere tertio

tertio ita inveniebantur. Primum quadrabantur latera circa rectum AC, & BC. Et è ſumma duorum illorum quadratorum extrahebatur radix: quæ radix erat latus AB, per penultimam primi Euclidis, h. e. per 50. primi noſtri.



Deinde habito latere AB, ita dicebatur:

Ut AB, latus ad BC, latus: ita AB radius ad BC, ſinum anguli BAC: quo noto notus erat etiam angulus ABC. Nunc iſtis ambagibus non eſt opus.

AXIOMA SECUNDUM.

In triangulis planis univerſis.

Latera ſe habent ad invicem, ut ſinus angulorum ipſis oppoſitorum.

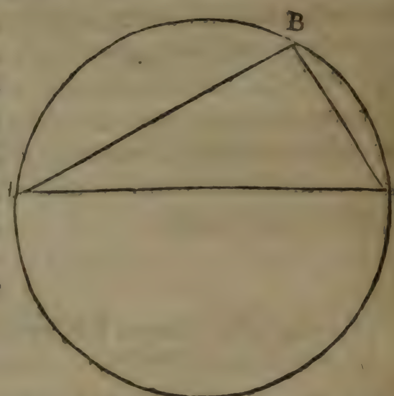
Sinus enim ſunt ſemiſſes ſubtenſarum. Atqui latera trianguli plani cujuſvis habent ſe ad invicem, ut ſubtenſæ angulorum ipſis oppoſitorum. *Ergo etiam ut ſemiſſes ſubtenſarum. Nam, quæ eſt ratio totius ad totum, eadem eſt ratio dimidii ad dimidium: ut libro ſecundo, propoſitione 19. oſtendimus: & natura ipſa dictat.*

Cæterùm, quod latera cujuſvis trianguli plani ſe habeant ad invicem, ut ſubtenſæ angulorum ipſis oppoſitorum, *inde patet: quia cuivis triangulo plano circulus circumſcribi poteſt: Centro ex tribus trium angulorum punctis inquiſito.*

Quod ſi fiat, latera trianguli plani jam reipſa ſunt ſubtenſæ angulorum ipſis oppoſitorum: hoc eſt, arcuum, qui angulos illos obeunt, & ſunt duplæ eorum menſuræ: per 53. p. 1.

Vt, ſi

Vt, si triangulo plano ABC, circumscribatur circulus ABC, latus AB, fit subtensa anguli ACB, hoc est, arcus AB, qui angulum ACB, obit. Latus BC, fit subtensa anguli BAC, hoc est, arcus BC, qui angulum BAC, obit. Latus denique AC, fit subtensa anguli ABC, hoc est, arcus AC, qui angulum ABC, obit.



Ergo latus AB, habet se ad latus BC: ut subtensa anguli ACB, ad subtensam anguli BAC, &c. quod demonstrandum erat.

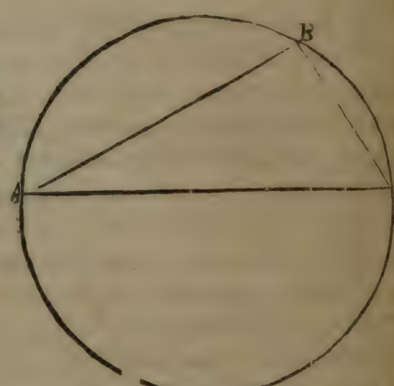
CONSECTARIUM PRIMUM.

Datis igitur angulis, datur ratio laterum.

Et per consequens:

Dato præter angulos unico latere, datur reliquorum laterum quodlibet.

Vt, in triangulo plano obliquangulo ABC, datis angulis ad A, 20. gr. 10'. ad C, 60. gr. 23'. atque adeo ad B, 99. gr. 27'. per 3. consf. 40. prop. 1. data est ratio laterum hoc modo:



AB,

AB, 8693512. sinus anguli ACB, 60. gr. 23'.

BC, 3447521. sinus anguli BAC, 20. gr. 16'.

AC, 9864292. sinus anguli ABC, 99. gr. 27'. sive complementi ad semicirculum. 80 gr. 33'.

Quod si ergo praeterea detur latus unum, v. g. latus AB, 34. pedum: dabuntur etiam latera reliqua BC, & ⌣AC. Nam

I. Vt ⌣AB, 8693512. ad BC, 3447521.

ita ⌣AB, 34. ped. ad BC, $13\frac{4200058}{8693512}$ ped.

Item:

II. Vt ⌣AB, 8693512. ad ⌣AC, 9864292.

ita ⌣AB, 34. ped. ad ⌣AC, $38\frac{5032472}{8693512}$ ped.

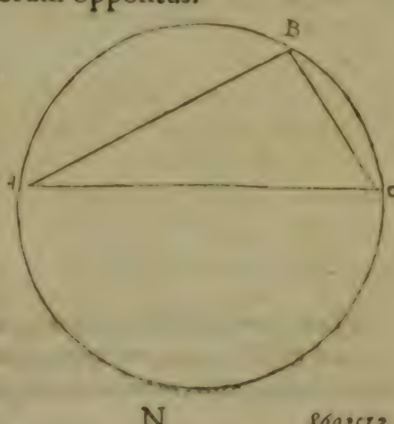
Vel transpositis terminis intermediis.

I. Vt ⌣ACB, 8693512. ad ⌣AB, 34. ped. ita BAC, 3447521. ad BC, $13\frac{42}{87}$ ped.

II. Vt ⌣ACB, 8693512. ad ⌣AB, 34. ped. ita ABC, 9864292. ad ⌣AC, $38\frac{50}{87}$ ped.

CONSECTARIUM SECUNDUM.

Datis duobus lateribus cum angulo uni eorum opposito, datur etiam angulus alteri eorum oppositus.



Vt, in praedicto triangulo obliquangulo ABC, datis duobus lateribus, AB, 34. ped. & BC, $13\frac{4200058}{8693512}$ ped. cum angulo ACB, uni datorum laterum, nempe lateri AB, opposito, 60 grad. 23'. dabitur etiam angulus BAC, alteri datorum laterum, nempe lateri BC, oppositus. Nam per datum angulum ACB, 60. gr. 23'. datus est sinus illius anguli ⌣AB, 8693512.

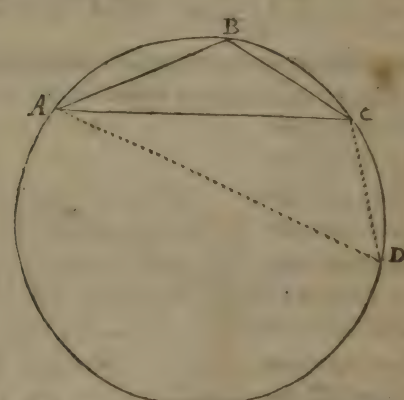
8693512. Dico igitur: Vt ◡AB, latus 34. ped. ad BC, latus $13\frac{4200058}{8693513}$ ped. ita ◡AB, ſinus anguli ◡ACB, 8693512. ad BC, ſinum anguli BAC, 3447521.

Vel tranſpoſitis terminis intermediis.

Vt ◡AB, 34. ped. ad ◡ACB, 8693512. ita BC, $13\frac{4200058}{8693512}$ ped. ad BAC, 3447521.

Cui ſinui in ſiniſtro Canonis margine reſpondet angulus 20. grad. 10'. Ergo angulus BAC, eſt 20. gr 10'.

NOTA. In uſu hujus conſectarii ambiguitas incidere poteſt: Si videlicet dentur duo latera, quorum alterum ſit latus maximum; unà cum angulo, minori datorum laterum oppoſito: & quæratur angulus maximo datorum laterum oppoſitus. Quia enim is angulus poteſt eſſe, vel acutus, vel obtuſus: utriuslibet autem ſinus eſt idem: per 1. conſ. 12. p. 2. invento ſinu anguli quæſiti, dubium eſt, an is ſinus indicet angulum acutum, an obtuſum.



Vt, in triangulo obliquangulo ◡ABC, ſi dentur duo latera ◡AC, 22. ped. & BC, 10. ped. unà cum angulo BAC, 24. gr. 50'. 10''. & quæratur angulus ◡ABC, maximo lateri ◡AC, oppoſitus: Si dixero.

Vt latus

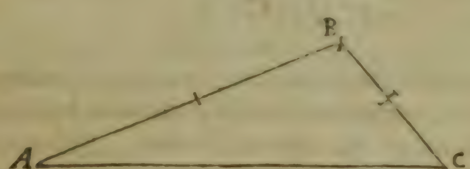
Vt latus BC, 10 ped. ad latus AC. 22. pedum: ita BC, sinus anguli BAC, 4200241. ad AC, sinum anguli ABC, prompte quidem invenero sinum AC, 9240530. At, quia is sinus, est sinus & acuti ADC, 67. gr. 31. 34. quem arcus ABC. obit; & obtusi, ABC, 112. gr. 28. 26. quem arcus ADC obit: dubium est, an angulus, per sinum illum indicatus sit obtusus 112 gr. 28. 26. an acutus 67. grad. 31. 34. Neq. aliter dubium hoc tolli potest, quam, si præter reliqua tria data. (quæ non minus in acutangulo ADC, quam in obtusangulo ABC, inesse possunt: positis nimirum lateribus BC & DC, atque adeo etiam angulis BAC & DAC, æqualibus) simul etiam hoc detur, vel ex accurata trianguli solvendi delineatione perspiciatur, utrum angulus quæsitus sit obtusus, an acutus.

AXIOMA TERTIUM.

In Triangulis planis universis:

Ut summa duorum laterum ad differentiam eorundem: ita tangens dimidii summæ duorum angulorum oppositorum, ad tangentem differentiæ infra, vel supra dimidium.

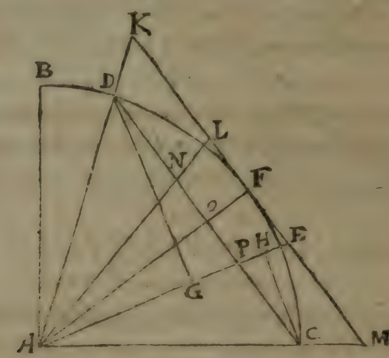
DECLARATIO. *In Triangulo plano obliquangulo ABC, dico tangentem dimidii summæ duorum angulorum ad A & B, esse ad tangentem differentiæ anguli B, supra, & anguli A, infra dimidium: Vt*



est summa duorum laterum BC, & AC, angulis illis oppositorum, ad differentiam eorundem.

DEMONSTRATIO. *Descripto enim quadrante ABC, statuantur anguli DAE; & EAC, angulis prioris schematis ABC, & BAC, æquales. Ac proinde, sit summa duorum illorum angulorum, angulus*

DAC. Dimidium illius summæ sit DAF, vel FAC. Differentia anguli DAE, supra dimidium DAF, vel anguli EAC, infra dimidium FAC, sit angulus FAE. Subtensa summæ duorum angulorum sit recta DC. Sinus anguli majoris DAE, sit recta DG. Sinus anguli minoris EAC sit recta CH. Tangens dimidii summæ duorum angulorum



sit FM, vel FK. Tangens differentiæ infra, vel supra dimidium sit FE. Iam Triangula GDP, & CPH, sunt æquiangula per 4.c.49.p.1.

Propter æquales DPG, & CPH, per 13 p.1. & rectos ad G & H, per 3. c.7.p.2. Ergo in hoc secundo schemate:

Vt PD, ad GD, ita PC, ad CH, per 46.p.1.

Sicut in primo:

Vt AC, ad ABC, ita BC, ad BAC, per axioma secundum. Latera igitur DP, & PC, prorsus eandem habent rationem in secundo schemate: quam latera AC & BC, in primo schemate. Quare rectam DC, pro summa datorum duorum laterum AC & BC, partes verò DP & PC, pro ipsis duobus lateribus AC & BC, assumere licet. Quo posito, NP, est differentia duorum laterum. Latera autem ibi AC & BC, hic DP & PC data sunt. Data igitur est etiam differentia eorum laterum NP, & ejus differentiæ dimidium OP. Porro, quia Triangula composita AKLFEM, & ADNOPC, sunt undiq; æquiangula: propter parallelas DC & KM.

Ideo

Ideo & latera & laterum segmenta habent proportionalia, per 46. & 47. p. 1. Ac proinde:

Vt DC, summa duorum laterum: ad NP, differentiam eorundem:

Ita KM dupla tangens dimidii summæ duorum angulorum, ad LE, duplam tangentem differentiæ infra, vel supra dimidium.

Vel:

Vt OC, dimidium summæ duorum laterum ad OP, dimidium differentiæ eorundem:

Ita FM, tangens dimidii summæ duorum angulorum oppositorum ad FE, tangentem differentiæ infra, vel supra dimidium.

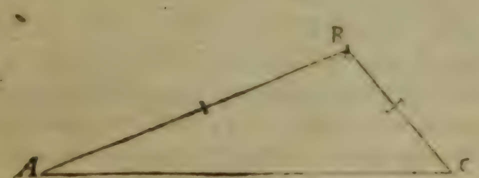
Vel:

Retentis prioribus quidem duobus proportionis terminis integris: posterioribus verò dimidiatis: compendiosioris calculi gratia,

Vt DC, summa duorum laterum ad NP, differentiam eorundem: ita FM, tangens dimidii duorum angulorum oppositorum ad FE, tangentem differentiæ infra, vel supra dimidium. Nam ut totum ad totum: ita pars ad partem. Ergo ut tota KM, ad totam LE, ita dimidia FM, ad dimidiam FE.

CONSECTARIUM.

Igitur in Triangulo plano obliquangulo, datis duobus lateribus, cum angulo ab ipsis comprehenso: dantur etiam reliqui duo anguli.



 Vt, in

Vt, in triangulo plano obliquangulo ABC, datis duobus lateribus ∠AB, 6. & BC, 3. pedum, unà cum angulo ABC, 107. gr. 30'. dabuntur etiam anguli BAC, & BCA, hoc modo.

Summa laterum datorum est 9. differentia 3.

Summa angulorum ad ∠A & C est 72. gr. 30'. per 49 p. 1.

Dimidium illius summæ, 36. gr. 15'. Ejus tangens 7332303.

Dico igitur:

Vt summa datorum laterum 9. ad differentiam eorundem 3. ita tangens dimidii summæ angulorum oppositorum 7332303. ad 2444101. tangentem arcus 13. grad. 44'. 4". differentiæ anguli ∠A infra, & C supra dimidium.

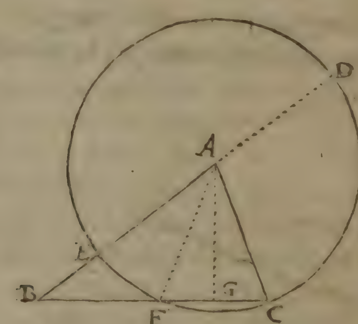
Ergo erunt:

	36. gr. 15'. 0".		*36. gr. 15'. 0".*
Subtr. 13.	*44. 4.*	*Adde. 13.*	*44. 4.*
Angulus BAC	*22. gr. 30'. 56".*	*Angulus BCA. 49.*	*59. 4.*

AXIOMA QUARTUM.

In Triangulis planis universis:

Ut latus maximum ad ſummam reliquorum laterum, ita differentia reliquorum laterum, ad ſegmentum lateris maximi: quo demto, in relicti dimidium perpendiculum cadit.

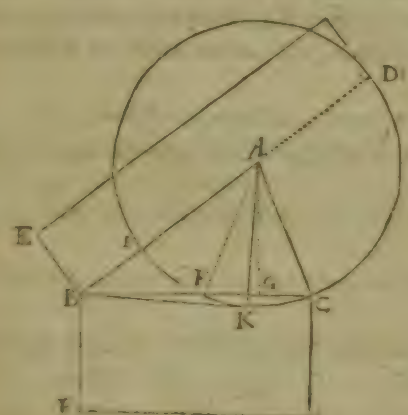


DECLA-

DECLARATIO. *Sit Triangulum obliquangulum ABC, eiusq; latus minimum AC, maximum BC. Radio lateris minimi AC, centro A describatur circulus CDEF, secans reliqua duo latera in punctis E & F. Et latus AB, porro producatur in D. Eritq; BD, summa laterum AB & AC. Nam AC & AD, æquantur per structuram, BE, vero erit differentia laterum AB & AC. Nam AE & AC, rursus æquantur per structuram. Dico*

Primum esse, ut CB, ad BD, ita EB ad BF.

Deinde, perpendiculum AG, bisecare rectam FC.



DEMONSTRATIO. *Nam, quod ad primum attinet, Rectangula æqualia habent latera reciproce proportionalia per 2.c.42.p.1 Atqui oblonga facta ex BD & BE, Item ex BC & BF, sunt rectangula æqualia. Ergo habent latera reciproce proportionalia: adeoq; ut BC, ad BD, ita BE ad BF.*

Minor

Minor probatur. Nam quæ uni sunt æqualia, etiam inter sese sunt æqualia. Atqui oblonga ex BC & BF. Item ex BD & BE, sunt æqualia uni quadrato rectæ, BK, tangentis anguli BAK. Ergo etiam inter sese sunt æqualia.

Minor rursum probatur. Ac primum quidem de oblongo BD, & BE, quod sit æquale quadrato BK, sic probatur: Si recta bisecta continuetur, oblongum continuatæ & continuationis est æquale quadrato rectæ ex bisegmento & continuatione compositæ: minus quadrato bisegmenti, per 44.p.1. Atqui ED, est recta bisecta in A & continuata ab E in B. Ergo oblongum continuatæ DB & continuationis EB, est æquale quadrato AB, minus quadrato EA, cui æquatur AK, per constructionem.

Atqui quadratum AB, minus quadrato AK est quadratum BK per 50.p.1.

Ergo oblongum BD, BE, æquatur quadrato BK.

Deinde verò, de oblongo BC, BF, quod sit æquale quadrato BK, sic probatur.

Oblongum BC, BF, est æquale quadrato BG, minus quadrato FG, per modo citatam 44 p.1.

Iam adde ad oblongum CB, BF, quadratum FG, & insuper quadratum AG.

Id si factum fuerit, oblongum BC, BF, unà cum quadratis FG & AG, erit æquale quadrato AB. Nam per additionem quadrati FG, completur quadratum BG, cui quadrato BG, si jungatur quadratum AG, conficitur quadratum AB.

Atqui quadrata FG & AG, sunt quadratum AF, per 50.p.1. cui æquatur AK, per structuram.

Ergo oblongum CB & BF unà cum quadrato AK est æquale quadrato AB. Ac proinde sine quadrato AK est æquale quadrato AB minus quadrato AK, hoc est, quadrato BK, per 50.p.1. Cæterùm, quod secundo loco proposuimus, de perpendiculo AG bisecante rectam FC, id sic probatur. Quia Triangulum FAC, est æqualium laterum FA & AC per structuram. Ergo perpendiculum AG, bisecat basin FG, per 23.p.1.

Igitur

Igitur in Triangulo obliquangulo, ut latus maximum ad summam reliquorum laterum: ita differentia reliquorum laterum ad segmentum lateris maximi; quo demto in relicti dimidium perpendiculum cadit. Quod demonstrandum erat.

CONSECTARIUM.

Datis igitur tribus trianguli plani obliquanguli lateribus, datur utrumvis segmentum maximi lateris, in quod ex angulo maximo perpendiculum cadit.

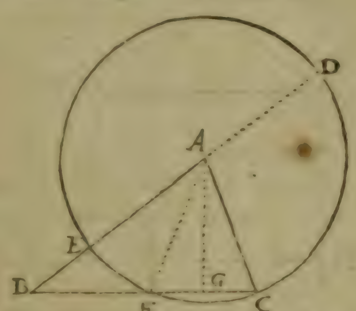
Vt, in triangulo plano obliquangulo ABC, sint data tria latera

AB, 20. pedum,

BC, 21. pedum,

AC, 13. pedum.

Quærantur autem segmenta lateris maximi BC, in quorum concursum perpendiculum cadat, nempe recta BG, & GC.



Latus maximum BC, est 21. pedum. Summa reliquorum duorum laterum est 33. pedum: differentia 7. Dico igitur:

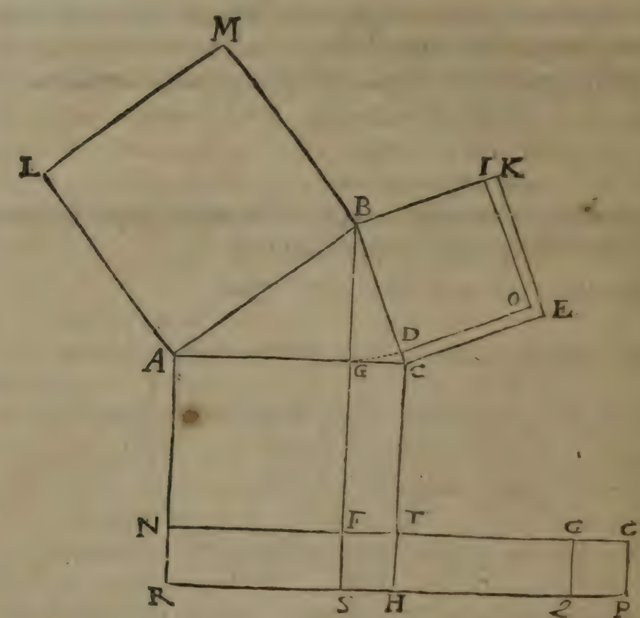
Vt BC, latus max. 21. ped. ad BD, summam reliquorum duorum laterum. 33. ped. ita BE, differentia reliquorum duorum laterum, 7 ped. ad BF, 11. ped. quo segmento demto, de BC, 21. ped. relinquitur FC, 10. ped. Cujus dimidium est FG, vel GC, 5. ped. Ergo GC, est 5. GB, 16. pedum.

 Scholion.

SCHOLION.

Axioma quartum etiam ſic proponi poteſt.

De ſumma quadratorum baſis & cruris unius, ſubtrahe quadratum alterius cruris: relictum divide per duplam baſin, & habebis ſegmentum baſeos inter perpendiculum & crus primò ſumtum interjacens.



DECLARATIO. *Sit triangulum obliquangulum varium ABC, & ſint data latera AB, BC, & AC. Quæratur autem ſegmentum GC. inter perpendiculum BG. & crus BC. interjicens. Dico, ſi de ſumma quadratorum baſeos AC & cruris BC ſubtrahatur quadratum lateris AB, & relictum per dupla baſin AC. dividatur, exiturum eſſe ſegmentum GC.*

DEMON-

DEMONSTRATIO. *Quadratum enim lateris AB. nempe quadratum ALMB æquale est quadratis laterum AG. & BG. simul sumtis per 50. prop. 1. Iam, quadratum lateris AG, est ANFG. Quadratum lateris BG. est BDOI: positis nempe rectis BG & BD. æqualibus. Ergo, si quadratum ALMB. à summa quadratorum ARHC & BCEK. subtrahas, restabunt duo Gnomones NHG & DEI. Gnomon autem DEI æquatur quadrato lateris GC. Nam quadratum lateris BC potest quadratum laterum BG & GC. rursum per 50. prop. 1. Atqui quadratum lateris BG. de quadrato lateris BC. jam detractum est, Igitur quod remansit, est æquale quadrato lateris GC: quod quadratum si ad Gnomonem NHG. in rectam RHQ. extensum addas, efficies oblongum NCPN. quod divisum per longitudinem NC, hoc est, per duplam AC, exhibet latitudinem CP. æqualem rectæ GC. per structuram.*

ILLUSTRATIO per numeros. *Sint data latera, ut ante: AB. 20. BC. 13. AC. 21 pedum. Quæratur autem segmentum GC, quot pedum? R. 5. Totus calculus ita erit.*

	AC. 21.	BC. 13.	AB. 20.
	21.	13.	20.
	21.	39.	Q. 400.
	42.	13.	
	Q. 441.	Q. 169.	
	Q. 169.		
Summa.	610.		
	Q. 400.		
Relictum.	210.		
AC duplum.	42 (5. GC.		
	210.		

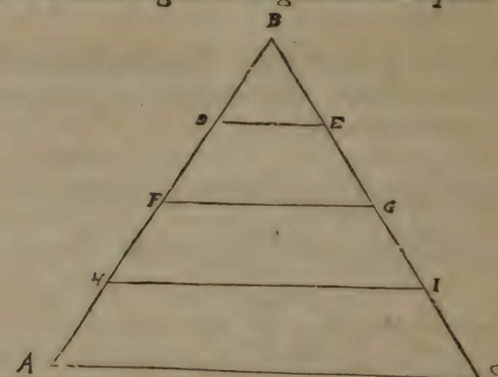
USUS PRÆCEDENTIUM AXIOMATUM:

Sive

Manuductio, qua oſtenditur, quomodo beneficio paucorum illorum axiomatum quodlibet triangulum planum ſolvi poſſit.

In triangulo quovis ſex ſunt: nempe tria latera & tres anguli. Horum tribus quibuſcunq; in triangulo plano datis, reliqua tria per præcedentia quatuor axiomata inveſtigari poſſunt: & quidem interdum variis modis: unico caſu excepto: ſi nempe ſoli tres anguli dentur.

Inde enim nullum latus inveſtigari poteſt. *Quia tres anguli trianguli unius, tribus angulis Trianguli alterius æquales eſſe poſſunt:*



etiamſi latera omnino ſint inæqualia. Vt tres anguli Triangulorum ABC & DBE ſunt æquales: propter baſes AC & DE, parallelas per 38.p.1.& tamen latera Trianguli ABC, multò ſunt majora, quam latera Trianguli DBE. Hic igitur caſus; isq; ſolus: à Trigonometria excipitur. In cæteris omnibus, ex quibuſvis tribus datis quodlibet quartum invenire licet. Quod per inductionem omnium caſuum demonſtrabimus, hoc modo.

Trian-

Triangulum planum eſt rectangulum, vel obliquangulum.

1. In Triangulo plano rectangulo: vel dantur omnes anguli (*dato nimirum unico acutorum*) cum uno latere: & quæruntur reliqua duo latera.

2. Vel dantur duo latera cum unico angulo, nempe recto; & quæruntur reliqui duo anguli; & latus tertium.

Utriq; caſui ſatisfacit axioma primum.

In triangulo plano obliquangulo:

1. Vel dantur omnes anguli: (*quoties nimirum duo dantur. Nam tertius ſemper eſt reliquorum duorum complementum ad duos rectos, per 3.c. 49. p. 1.*) cum uno latere, & quæruntur reliqua duo latera.

2. Vel dantur duo latera, cum angulo, uni datorum laterum oppoſito; & quæritur angulus alteri datorum laterum oppoſitus; unà cum latere tertio.

3. Vel dantur duo latera cum angulo ab ipſis comprehenſo; & quæruntur reliqui duo anguli, cum tertio latere.

4. Vel denique dantur omnia tria latera, & quæruntur anguli.

Prioribus duobus caſibus plenè ſatisfacit axioma ſecundū.

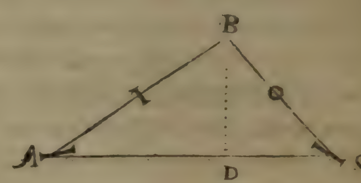
In tertio caſu duo anguli ignoti reperiuntur, per axioma tertium: & deinde latus tertium per axioma ſecundum.

In quarto caſu primùm fit dislocatio trianguli plani obliquanguli, in duo rectangula: dimiſſo in latus maximum perpendiculo: per axioma quartum: deinde in triangulis illis rectangulis quilibet anguli inveniuntur per axioma primum.

¶ *Sed & per ſolum primum axioma priores tres caſus expediri poſſunt. ſi modo ab angulo aliquo ignoto in latus oppoſitum ignotum vel intra, vel extra triangulum: (in quo caſu latus ignotum antea ſatis prolongandum eſt) perpendiculum dimittatur: & ita triangulum planum*

obliquangulum in duo rectangula dislocetur: sive perpendiculum cadat extra, sive intra triangulum.

(Porro hæc conditio: quod latus perpendiculum excipiens ignotum esse debeat, tantum in exemplis secundi axiomatis locum habet, in exemplis tertii axiomatis planorum non item.)

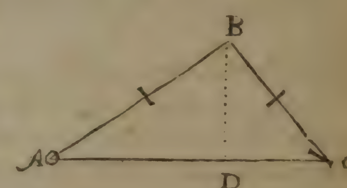


Vt 1. Si detur talis proportio: Vt ◡AB, sinus anguli ◡ACB ad BC, sinum anguli BAC, ita AB, latus ad BC, latus: per axioma secundum.

Eodem effectu dicere potes: per axioma primum:

I. Vt ◡AB, radius ad BD, sinum anguli BAD: ita ◡AB latus, ad BD latus.

II. Vt BD radius, ad BC, secantem anguli DBC, (qui est complementum anguli BCD,) ita BD, latus ad BC, latus.



2. Si detur talis proportio: Vt ◡AB, latus ad BC, latus, ita ◡AB, sinus anguli ◡ACB, ad BC, sinũ anguli BAC, per axioma secundum.

Eodem effectu dicere potes, per axioma primum.

I. Vt BC, radius ad BD, sinũ anguli BCD, ita BC, latus ad BD, latus.

II. Vt BD, latus ad AB latus: ita BD radius, ad ◡AB secantem anguli ◡ABD, cujus complementum est angulus BAD. Ipse verò angulus ◡ABD, compositus cum angulo DBC, efficit angulum ABC.

3. Si detur talis proportio: Vt summa laterum AB & AC, ad differentiam eorundem; ita tangens dimidii summæ angulorum ABC & ACB, ad

ACB, ad tangentem differentiæ infra, vel supra dimidium: per axioma tertium.

Eodem effectu dicere potes, per axioma primum.

I. Vt AB radius ad BD sinum anguli BAD, ita AB, latus ad BD latus.

II. Vt AB radius, ad AD, sinum anguli ABD, ita AB, latus ad AD, latus: unde si detrahas latus AC, restat latus DC.

III. Vt DC latus ad BD latus: ita DC, radius ad BD, tangentem anguli DCB, quo addito ad angulum BAC, & summâ detractâ de duobus rectis, relinquitur angulus ABC. Quod si præterea velis latus BC, dices itidem per axioma primum: Vt radius DC, ad secantem BC anguli DCB, ita latus DC, ad latus BC.

BAR-

BARTHOLOMÆI
Pitiſci Grunbergenſis

TRIGONOMETRIÆ

LIBER QUARTUS.

De dimenſione Triangulorum Sphæricorum.

Axiomata proportionum in Triangulis Sphæricis exiſtentium præcipua, & ad omnem eorum ſolutionem abunde ſufficientia ſunt quatuor.

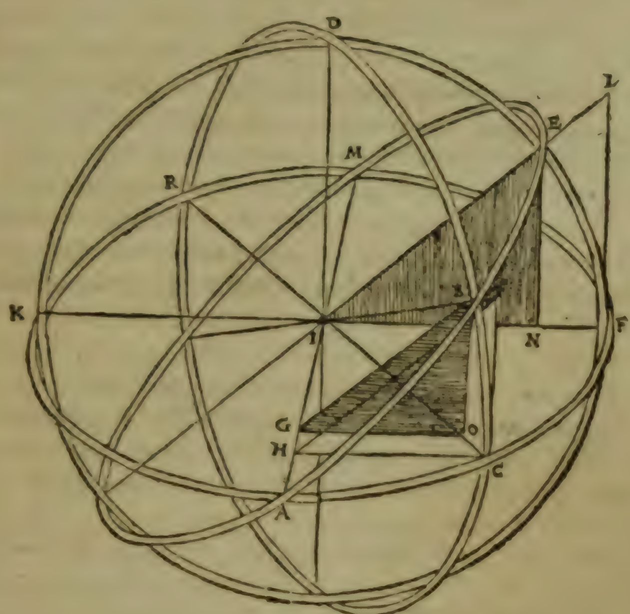
AXIOMA PRIMUM.

In Triangulis Sphæricis rectangulis pluribus, acutum ad baſes eundem habentibus:

Sinus hypotenuſarum & perpendiculorum omnes ſunt inter ſeſe proportionales.

DECLARATIO. *Sit ſphæra propoſita KMFAD, & ſint in ea: horizon KMFA: polus horizontis D, circuli per polum horizontis D tranſeuntes KDF & RDC ſecantes horizontem angulis ad KRF & C rectis per 57.p.1. circulus horizonti obliquus* ◡*MEA, ſecans verticalem KDF, angulis ad E, rectis: quippe qui per ejus polos* ◡*M &* ◡*A tranſeat: per 57.p.1. ac viciſſim ab eo ſecti⁹ in duos quadrantes ME& EA per 56.p.1. In iſta ſphæra, & in iſta circulorũ cõſtitutione ſint inter alia duo Triãgula Sphærica rectangula ABC& AEF, & ſint in illis, hypotenuſæ AE& AB,* perpen-

perpendicula EF & BC, bases ◡AF & ◡AC, & acutus ad bases ◡AF, & ◡AC, idem EAF vel BAC. Deniq; sinus hypotenusarum ◡AE, & AB,



sint rectæ IE radius & GB. Sinus verò perpendiculorum EF & BC sint rectæ EN & BO, omnia per 7.p.2. Dico jam, Sinus illos hypotenusarum & perpendiculorum, nempe sinus IE, GB, EN & BO, omnes esse inter sese proportionales: adeoq; datis quibuscunq; tribus, elici posse quartum. Clarius: dico esse

Vt IE, ad EN, ita GB, ad BO, & vicissim
Vt GB, ad BO, ita IE, ad EN, & contra.
Vt NE, ad EI, ita OB, ad BG.

Vel transpositis terminis intermediis, per 42. p. 1.
Vt IE, ad GB, ita EN, ad BO, & vicissim
Vt GB, ad IE, ita BO, ad EN, & contra.
Vt NE, ad OB, ita EI, ad BG.

DEMONSTRATIO. *Si enim sinus GB & BO, connectas rectâ GO, ut fiat inde Triangulum GBO, manifestum est Triangula GBO & IEN, fore æquiangula. Primum enim, quia rectæ EN & BO, perpendiculariter cadunt in subjectum planum MFC, per thesin, & per 3. c. 12. p. 2. Ideo cum omnibus lineis in eo plano ductis constituunt angulos rectos: adeoq; anguli ENI & BOG, sunt recti. Deinde quia recta IE & GB sunt invicem parallelæ per 38. p. 1. quippe ad eandem rectam IA, normales per 3. c. 7. 2. totum autem planum MEA, ubiq; eodem angulo ad planum MFA, est inclinatum: ideo etiam parallelæ in eo ductæ IE & GB, ad parallelas IN & GO, in plano MEA, sibi subjectas eodem angulo sunt inclinatæ: atq; adeo anguli EIN & BGO, sunt æquales. Et per consequens in Triangulis IEN & GBO, jam duo sunt anguli duobus æquales. Ergo etiam tertius tertio est æqualis: per 49. p. 1. ac proinde Triangula IEN & GBO, sunt æquiangula. Quod si sunt æquiangula, etiam latera habent circa æquales angulos proportionalia, per 46. p. 1. adeoq; sunt: Vt IE ad EN, ita GB, ad BO, &c. Quod demonstrandum erat.*

ILLUSTRATIO per numeros.

Sint ergo datæ hypotenusæ AE, 90. gr. & AB, 42. gr. una cum perpendiculo EF, 48 gr. 25. m. Quæratur autem perpendiculum BC.

Arcuum datorum	*AE. 90. gr.* *AB, 42. gr.* *EF, 48. gr. 25. m.*	*Sinus sunt*	*IE 10000000.* *GB 6691306.* *EN 7479912.*

Dico igitur:

Vt IE, 10000000. ad EN, 7479912, ita GB, 6691306. ad BO, 5005038.
Atqui sinui 5005038. in tabulis respondet arcus 30. gr. 2. m.
Ergo perpendiculum BC, est 30. gr. 2. m.

Sint

Sint viciſſim datæ utræque hypotenuſæ unà cum ſuis finibus, ut ante. Sed ex perpendiculis ſit jam datum perpendiculum BC, 30. gr. 2. m. una cum ſinu ſuo BO, 5005038. Quæratur autem perpendiculum EF. Dico:

Vt GB, 6691306. ad BO, 5005038. ita IE, 10000000. ad EN, 7479912.
Atqui ſinui 7479912. in tabulis reſpondet arcus 48. gr. 25. m.
Ergo arcus EF, eſt 48. gr. 25. m.

Sint contra data utraque perpendicula EF & BC unà cum hypotenuſa majore AE. Quæratur autem hypotenuſa minor AB, Dico:

Vt EN, 7479912. ad IE, 10000000. ita BO, 5005038. ad GB, 6691306.
Atqui ſinui 6691306. in tabulis reſpondet arcus 42. gr.
Ergo hypotenuſa AB, eſt 42. gr.

AXIOMA SECUNDUM.

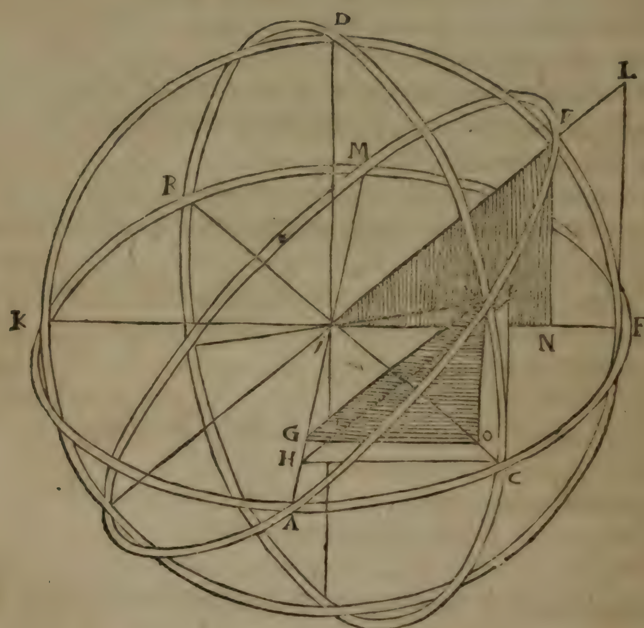
In Triangulis Sphæricis Rectangulis pluribus, acutum ad baſes eundem habentibus:

Sinus baſium & tangentes perpendiculorum omnes ſunt inter ſeſe proportionales.

DECLARATIO. *In priore diagrammate: & in iiſdem Triangulis AEF, & ABC, in quibus ſinus baſium AF & AC, ſunt IF & HC. Tangentes verò perpendiculorum EF & BC, ſunt LF & PC. Dico: ſinus illos baſium & tangentes perpendiculorum nempe ſinus IF & HC, & tangentes LF & PC, omnes eſſe inter ſeſe proportionales: adeoque datis quibuſcunque tribus, elici poſſe quartum. Clarius: Dico eſſe*

Vt IF, ad FL, ita HC ad CP, & viciſſim.
Vt HC, ad CP, ita IF ad FL, & contra.
Vt FL, ad FI, ita PC ad CH.

Vel transpositis terminis intermediis, per 42.p.5.



Vt IF, ad HC, ita FL ad CP, & viciſſim
Vt HC, ad IF, ita CP ad FL, & contra.
Vt LF, ad PC, ita FI ad CH.

DEMONSTRATIO. *Ductis enim rectis IL & HP, completisq; Triangulis ILF & HPC, Triangula illa ILF & HPC, erunt æquiangula. Ergo & lateribus proportionalia per 46.p. 1. Triangula autem ILF & HPC erunt æquiangula propter rectos ad F & C, & æquales ad I& H, ac proinde etiam ad L & P, per 49.p.1. Anguli porro ad F & C, nempe anguli IFL & HCP, ſunt recti: quia tangentes arcuum perpendicularium EF & BC, nempe rectæ LF & PC, ſunt in totum planum circuli*

circuli MFA perpendiculares, per thesin & per 8.p.2. Ergo etiam in lineas IF & HC, in illo plano ductas. Anguli deniq; ad I & H, nempe anguli LIF & PHC, sunt æquales: quia rectæ IL & HP, per idem planum ductæ, sunt & inter sese & ad planum circuli inclinationis KDF parallelæ. Æqualibus igitur angulis sunt ad subjectas parallelas IF & HC, inclinatæ. Quæ duæ, IF & HC, propterea parallelæ sunt: quia utraq; sunt ad rectam IA normales, per 3.c.7.p.2. Rectæ autem IL & HP, sunt parallelæ: quia sunt extremitates duorum Triangulorum ILF & HPC, quæ totis suis planis sunt invicem parallela: quippe super bases IF & HC, parallelas perpendiculariter propter tangentes CD & FL, perpendiculares.) erectæ. Rectæ deniq; IL & HP, sunt per idem planum semicirculi MBA, ductæ: quia secans quidem IL, cum secet circulum MEA, ad punctum E, non nisi per planum illius circuli incedere potest. Similiterq; secans IP, cum secet eundem circulum MEA, ad punctum B, non nisi per planum ejusdem illius circuli incedere potest. Quod planum quia planū est, ideo si extenderetur secundum lineam rectam IP, in tangentem PC, ad punctum P. incumberet: adeoq; punctū P, esset in plano circuli MEA, satis extenso, constitutum. Atqui in eodem plano etiam punctum H, est constitutum. Ergo recta PH, est linea inter duo puncta ejusdem plani interjecta: ac proinde per idem planum ducta. Quæ omnia demonstranda erunt.

ILLUSTRATIO per numeros. Sint ergo datæ bases AF, 90. gr. AC, 30. gr. 51'. 46''. unà cum perpendiculo EF, 48.2'5. Quæratur autem perpendiculum BC.

Basium	*⌒AF, 90. gr. 0'.*	*Sinus sunt.*	*10000000 IF.*
	⌒AC, 30 gr. 51'. 46''.		*5129836. HC.*

Perpendiculi FF, 48.25. Tangens est 11269872. LF.

Dico igitur:

Vt IF, 10000000. ad LF, 11269872, ita HC, 5129838. ad PC, tang. 5781.62.

Atqui Tangenti 5781262. in tabulis respondet arcus 30. gr. 2. m. Ergo perpendiculum BC, est 30.gr.2.m.

Sint vicissim datæ utraq; bases, unà cum suis sinibus, ut ante. Sed ex perpendiculis sit jam datum perpendiculum BC, 30. gr. 2'. unà cum tangente sua CP, 5781262. Quæratur autem perpendiculum EF. Dico:

Vt HC, 5129838. ad CP, 5781262, ita IF, 10000000. ad FL. tang. 11269872.

Atqui tangenti 11269872. in tabulis respondet arcus 48. gr. 25. m. Ergo perpendiculum EF, est 48. gr. 25. m.

Sint contra data utraque perpendicula EF & BC, & eorum tangentes LF & PC, unà cum basi majore AF & ejus sinu IF. Quæratur autem basis minor AC, sive potius ejus sinus HC. Dico:

Vt LF, tang. 11269872. ad FI, rad. 10000000, ita PC, tang. 5781262. ad HC, 5129838. sinum arcus 30. gr. 51'. 46''. Igitur arcus, sive basis AC, est 30. gr. 51. m. 46''.

APPENDIX. *Ex his duobus axiomatibus, & eorum declarationibus ac demonstrationibus intelliget ingeniosus lector: cur à sinibus basium ad sinus perpendiculorum, & contra, argumentari non liceat: cum tamen à sinibus hypotenusarum ad sinus perpendiculorum, & contra, argumentari liceat: quia nimirum sinus basium & perpendiculorum in eadem Triangula rectilinea non concurrunt. Quod etiam doctissimos alioqui mathematicos interdum non animadvertisse videas.*

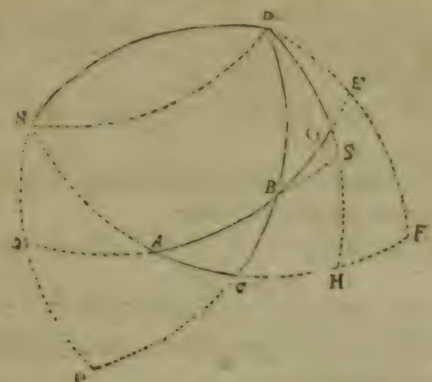
AXIOMA TERTIUM.

In Triangulis Sphæricis universis:

Sinus laterum, sinibus oppositorũ angulorum sunt directè proportionales.

DECLARATIO. *Primùm esto Triangulum Sphæricum ABC, rectangulum ad C. Deinde continuatis lateribus AB & AC, & CB, usq; ad quadra. ut fiant AE, AF & CD, & dimissis ex polo quadrantis AF,*

nempe



nempe ex puncto D, aliis duobus quadrantibus DF, & DH, atq; ita constitutis tribus Triangulis novis: rectangulis quidem BDE & GDE, obliquangulo verò BDG. Dico.

In Triangulo sphærico rectangulo ◡ABC, esse◡:

Vt ACB, ad AB, ita ABC, ad AC, & ita BAC, ad BC.

Vel transpositis terminis intermediis, per 42. p. 1.

Vt ◡ACB, ad ABC, ita ◡AB, ad AC, &

Vt ◡ACB, ad BAC, ita ◡AB ad BC, &c.

Similiterq; in Triangulo sphærico obliquangulo BDG, dico esse◡:

Vt BDG, ad BG, ita BGD, ad BD, & ita DBG ad DG, &c.

DEMONSTRATIO. *Nam, quod attinet ad rectangulum ABC, in eo ACB & AE Itemq; BAC & EF, & ex altera parte ABC, & OP, hoc est, anguli & mensuræ illorum angulorum:*

(Nam ut EF, est mensura anguli EAF, & OP, mensura anguli ABC, ita ND, sive illi æqualis AE, vel OB, est mensura anguli ACB, per 57. p. 1.) *sunt ejusdem quantitatis.*

Ergo perinde est, sive dicam:

Vt ACB, ad AB, ita BAC, ad BC, sive◡

Vt ◡AE, ad AB, ita EF, ad BC.

Atqui hoc valet, per primum axioma sphæricorum. Ergo etiam illud.

Item

Item perinde est, sive dicam:

Vt ACB, ad ◡AB, ita ABC, ad ◡AC, sive

Vt OB, ad ◡AB, ita OP, ad ◡AC.

Atqui hoc valet, per primum axioma sphæricorum.

Ergo etiam illud.

Quæ verò conveniunt uni tertio, etiam inter se conveniunt.

Atqui per demonstrata:

Vt ACB, ad AB, ita ABC, ad ◡AC, & ita BAC, ad BC.

Ergo etiam

Vt ◡ABC, ad ◡AC, ita BAC, ad BC.

Deinde, quod attinet ad obliquangulum BDG. Quia per demonstrationem Rectangulorum sunt:

Vt DB, ad DEB, ita DE, ad DBE. Et

Vt DG, ad DEG, ita DE, ad DGE.

Vel per 1. c. 7. p. 2. ad DGB.

Ideo per terminorum proportionalium permutationem etiam erit:

Vt DG, ad DB, ita DBE, vel DBG, ad DGB, &c.

Similiterq; Si à puncto B, in S, arcus perpendicularis demittatur. Quia tum erunt:

Vt BD, ad BSD, ita BS, ad BDS. Et

Vt BG, ad BSG, ita BS, ad BGS.

Sive per 1. c. 7. p. 2. ad BGD.

Ideo etiam erit:

Vt BG, ad BD, ita BDS, sive BDG, ad DGB, &c.

Nam si sint

Vt 4. ad 12, ita 1. ad 3. Et

Vt 2. ad 12, ita 1. ad 6.

Erit etiam

Vt 2. ad 4, ita 3. ad 6.

ILLU-

ILLUSTRATIO per numeros. In triangulo igitur sphærico rectangulo ABC, primum sint data ACB, AB & ABC: in eadem quantitate, in qua pridem. Quæratur autem latus AC, angulo dato ABC, oppositum. Dico:

Vt ◡ACB, 90. gr. ad ◡AB, 42. gr. ita ◡ABC, 50. gr. 3'. 12".

10000000. 6691306. 7660422.

◡Ad ◡AC, 30. 51'. 46".

5129838.

Vel viceversa: Sint data, AB & ACB & AC. Quæratur autem ABC. Dico:

Vt ◡AB, 42. gr. ad ◡ACB, 90. gr. ita ◡AC, 30. gr. 51'.

6691306. 10000000. 5129838.

ad ABC, 7660422. Sinum arcus, vel anguli 50. grad. 3'. 12".

Deinde sint data: ACB & AB & BAC. Quæratur autem BC. Dico:

Vt ACB, 90. grad. ad AB, 42. grad. ita BAC, 48. grad. 25.

10000000. 6691306. 7479912.

ad BC, 5005038. sinum arcus 30. gr. 2'.

Vel viceversa: Sint data AB & ACB & BC. Quæratur autem BAC. Dico:

Vt AB, 42. grad. ad ACB, 90. grad. ita BC, 30. grad. 2'.

6691306. 10000000. 5005038.

ad BAC, 7479912. Sinum 48. gr. 25'.

Denique, sint data BAC, & BC & ABC. Quæratur autem AC. Dico:

Vt BAC, 48. gr. 25'. ad BC, 30. gr. 2'. ita ◡ABC, 50. gr. 3'. 12".

7479912. 5005038. 7660422.

ad ◡AC, 5129838. sinum 30. gr. 51'. 46".

Vel viceverſa: Sint data, BC & BAC & AC. Quæratur autem ABC. Dico:

Vt BC, 30. gr. 2'. ad BAC, 4 gr. 8. 25'. ita ◡AC, 30. gr. 51' 46".

5005038. 7479912. 5129838.

ad ◡ABC, 7666422. ſinum 50. gr. 3'. 12".

Similiter in Triangulo ſphærico obliquangulo BDG. Primum ſint data DBG, DG & BDG. Quæratur autem BG. Dico:

Vt DBG, 5. gr. 0. 3' 12". ad DG, 4. gr. 5. 57' 41". ita BDG 2. gr. 8. 1'. 4.

7666422. 7188714. 4730634.

ad BG, 4435860. ſinum 2 grad. 6. 19'. 58".

Deinde ſint data BG, BDG & DG. Quæratur autem DBG. Dico:

Vt BG, 26. gr. 1' 9. 58". ad BDG, 2. gr. 8. 14'. ita DG 4. gr. 5. 57'. 41".

4435860. 4730634. 7188714.

ad DBG, 7666422. ſinum 5. gr. 0. 3'. 12".

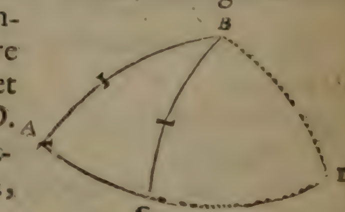
Denique, ſint data DG, DBG & DB. Quæratur autem DGB Dico:

Vt DG, 4. gr. 5. 57'. 41". ad DBG, 5. gr. 0. 3'. 12". ita DB, 5. gr. 9. 58.

718871. 7666422. 8657344.

ad DGB, 9232491. Sinum anguli obtuſi 112. gr. 35'. 40".

NOTA. In uſu hujus axiomatis eadem ambiguitas accidere poteſt, quam in uſu ſecundi axiomatis planorum accidere poſſe ſupra diximus: uti apparet ex Schemate conſimili ABCD. Ideo ne in tali caſu decipiaris, acutum pro obtuſo, aut contra, colligendo, attendas oportet.



AXIO-

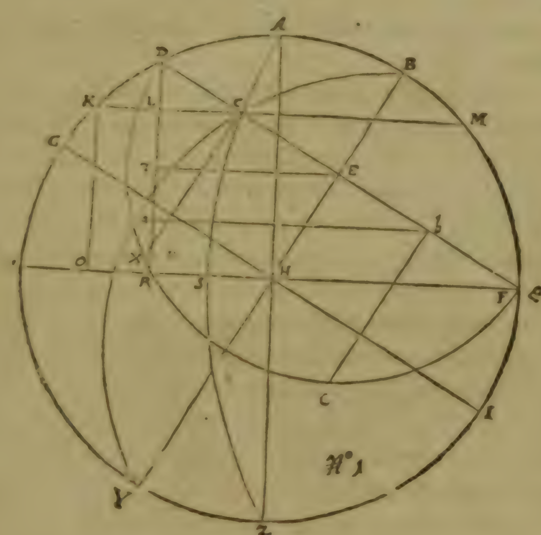
AXIOMA QUARTUM.

In Triangulis ſphæricis univerſis:

Si duo latera ſigillatim quadrantibus minora, primum ipſa inter ſeſe, deinde latus minus cum complemento majoris componas; Et ſinui arcus compoſiti poſterioris ſinum complementi arcus compoſiti prioris ſubtrahas, vel ſinum exceſſus addas:

Eſt

Ut Radius ad medietatem rectæ per illam, ſive ſubtractionem, ſive additionem factæ: ita ſinus verſus anguli à dictis duobus lateribus comprehenſi ad rectam, qua ſub-



tracta de ſinu arcus compoſiti poſterioris, relinquitur ſinus complementi tertii lateris: vel de qua ſubtractus ſinus arcus compoſiti poſterioris relinquit ſinum exceſſus tertii lateris. *Vel contra:*

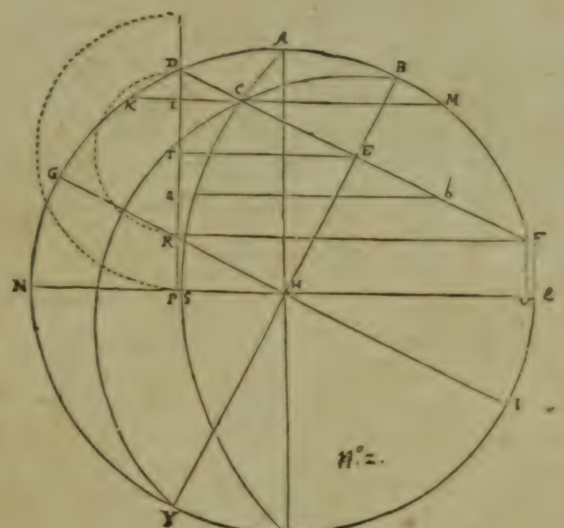
Vt medietas rectæ ad radium: ita recta, ex ſinu arcus compoſiti poſterioris, vel per ſubtractionem ſinus complementi, tertii lateris; vel per additionem ſinus exceſſus, ejuſdem tertii lateris, facta, ad ſinum verſum anguli à reliquis duobus lateribus comprehenſi.

DECLARATIO. *Hoc axioma varios habet caſus.*

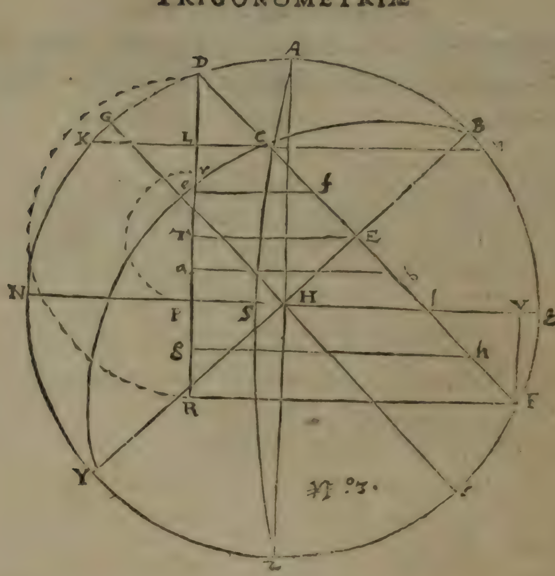
Primùm enim, duo latera, angulum datum, aut quæſitum includentia, ſimul ſumta, vel ſunt quadranti æqualia, vel inæqualia: & hæc, minora, vel majora. Deinde angulus datus, aut quæſitus, vel eſt rectus, vel obliquus: atq; is acutus, vel obtuſus. Deniq; latus tertium, angulo dicto oppoſitum, vel eſt quadrante minus, vel majus. Tribus autem ſchematibus omnes iſtos caſus, ſatis perſpicuè, ut opinor, explicabimus.

In quorum ſingulis Triangulum obliquangulum, exempli gratia, propoſitum eſt ABC, in quo, vel data ſunt duo latera AB & BC, unà cum angulo ad B, & quæſitum latus tertium AC, vel data ſunt omnia tria latera, & quæſitus angulus lateri tertio AC, oppoſitus. Porrò, duorum laterum AB & BC, datum, vel quæſitum angulum (qui ſemper ſtatuitur ad B) includentium, latus minus eſt ◡AB, latus majus BC. Lateri minori AB, eſt æqualis arcus GN, per ſtructuram. Lateri majori BC, abſcindantur de circulo DAB, arcus æquales BF & BD, per parallelum polo B, expanſione circini BC, in ſuperficie globi deſcriptum: cujus paralleli diameter eſt DCF, circumferentia in primo tantum ſchemate notata DXF, puncto ſuo X, in globo concurrens cum puncto C, circuli maximi BC. Et in illo ipſo parallelo DXF notetur menſura anguli ad B, arcus DX, per 6.p.1. ejuſq; ſinus rectus XC, per 7.p.2. & ſinus verſus, DC, per 8.p.2. Lateri deniq; tertio AC itidem abſcindantur de circulo DAB arcus æquales AK & AM, per parallelum KCM, polo A, expanſione circini ◡AC, in ſuperficie globi deſcriptum. His ita præſtructis, pri-

ctis, primùm componantur duo latera AB & BC, vel BF, datum, vel quæsitum angulum ABC, includentia: & sit arcus compositus prior



AF, in primo schemate quadranti AQ, æqualis: in secundo minor: in tertio major. Ac notetur in secundo, vel tertio schemate sinus complementi, vel excessus VF. Deinde latus minus AB, hoc est, per structuram GN, componatur cum complemento lateris majoris GD, & sit arcus compositus posterior DN, ejusq; sinus rectus DP. De quo sinu DP, subtrahatur in secundo schemate sinus complementi VF, vel PR. In tertio verò schemate ad eundem sinum DP, addatur sinus excessus VF, vel PR, ut innotescat recta DR, quæ juncta cum recta DF, per rectam RF, constituat Triangulum planum rectangulum DRF, per cujus medium ducatur recta TE, bisecans rectam DF in E, per structuram:



ram: adeoq; etiam rectam DR, per 45. p. 1. & constituens Triangulum DTE, æquiangulum Triangulo DRF, per 38. p. 1.

Quo Triangulo DTE, constituto: Dico quod sit:

Vt radius ED, ad medietatem rectæ DR, nempe ad rectam DT, ita sinus versus anguli ∠ABC, nempe recta DC, ad rectam DL, quâ demtâ de sinu arcus compositi posterioris DP, relinquitur recta LP, sive per 39. p. 1. KO, sinus rectus arcus KN, sive CS, complementi tertii lateris ∠AC.

Et contra:

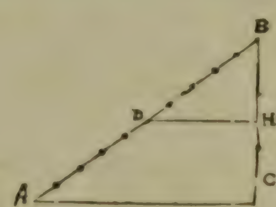
Vt medietas rectæ DT, ad radium DE, ita recta DL, post subtractum sinum complementi tertii lateris de sinu DP reliqua, ad sinum versum DC, &c.

DEMONSTRATIO. Triangula enim TDE, & LDC, sunt æquiangula:

angula: per ſtructuram, & per 38 p. 1. Ergo latera habent circa æquales angulos proportionalia, per 46 p. 1. Nec obſtat, quod rectæ DC & DE, ſunt in minores partes diſtributæ, quam rectæ DL & DT, propter radium DE, minorem radio HG, cum quo radio HG, in partes æquales diviſæ ſunt rectæ DL & DT. Nam in quaſcunq; partes unum, vel alterum latus in Triangulo plano dividatur: modo latus homogeneum cum homogeneo, hoc eſt, hypotenuſa cum hypotenuſa, perpendiculum cum perpendiculo, & baſis cum baſi in eaſdem partes dividatur: nihil intereſt. Verbi gratia, in Triangulis ◡ABC & DBE, nihil intereſt, ſive dicam,

Ut ◡AB, 10. ad DB, 5. ita BC, 3. ad BE, $1\frac{1}{2}$.

Sive:

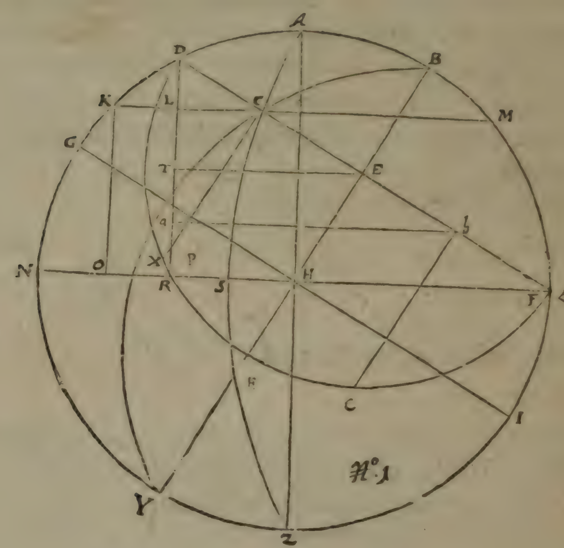


Ut ◡AB, 5. ad DB, $2\frac{1}{2}$. ita BC, 3. ad BE, $1\frac{1}{2}$.

CONSECTARIUM. Ex hac declaratione & demonſtratione patet: Si angulus datus ad B, ſit rectus: ejuſq; ſinus verſus EB, radius: in eo caſu nulla, vel diviſione, vel multiplicatione opus eſſe: ſed per ſolam additionem & ſubtractionem ſinum complementi tertii lateris reperiri poſſe. Quod compendium calculi Trigonometrici quovis auro eſt precioſius. Et etiamnum compendioſius fieri poteſt: ſi in ſecundo ſchemate ſinus VF, non ſubtrahatur de ſinu DP, ſed è contrario addatur ad ſinum DP, recta Dr, æqualis ſinui VF. Tùm enim medietas rectæ rP, ſtatim erit ſinus TP, quæſitus. Et, ſi in tertio ſchemate ſinus VF, non addatur ad ſinum DP, ſed ex altera parte tantundem, nempe recta Dr, ab eo auferatur. Nam & tùm medietas rectæ rP, ſtatim erit ſinus TP, quæſitus.

ILLUSTRATIO PER NUMEROS. Primùm genus exemplorum: ubi datis duobus lateribus conjunctim quadranti

dranti æqualibus, unà cum angulo ab ipsis comprehenso, quæritur latus tertium: aut contra: dato etiam latere tertio, quæritur angulus ipsi oppositus. Secundum schema Num. 1.



N°. 1

I. Si angulus datus sit rectus: ejusq; sinus versus DE.

AB, 35. gr. 40'. Idem. 35. gr. 40'.

BC, 54. 20. Compl. 35. 40.

AF, 90. 0. DN, 71. 20. DP, 9473966.

DT, vel TR, 4736983. Sinus arcus 28. gr. 16'. 29". cujus complem. 61. gr. 43'. 31", est arcus AC, quæsitus.

II. Si

II. Si angulus datus sit acutus: ejusq. sinus versus DC.

AB, 35.gr.40'. Idem 35 gr.40'.
BC, 54. 20.compl.35. 40.
AF, 90. 0. DN, 71. 20. DP, 9473966.
DT, 4736983.

ABC, 50.0. Rad. DE, 10000000.
Compl.40.0. ---- CE, 6427876.
DC, 3572124.

Vt ED, 10000000. ad DT, 4736983, ita DC, 3572124. ad DL, 1692109. quo subtracto de DP, 9473966. relinquitur LP, 7781857. sinus arcus 51 gr. 5'. 41''. cuius complementum 38. gr. 54'. 19''. est arcus AC quaesitus.

III. Si angulus datus sit obtusus: ejusq. sinus versus Db.

AB, 35. gr. 40. Idem 35. 40.
BC, 54. 20. Compl. 35. 40.
AF, 90. 0. DN, 71. 20. DP 9473966.
DT, 4736983.

ABC, 112. gr. 35'.
90. 0. DE, 10000000.
22. 35. Eb, 3840267.
Db, 13840267.

Vt DE, 10000000. ad DT, 4736983, ita Db, 13840267. ad Da, 6556111. quo subtracto de DP, 9473966. relinquitur aP 2917855. sinus arcus 16. gr.. 57'. 53''. cujus complementum 73. gr.. 2'. 7''. est arcus AC, quaesitus.

IV. Si datum sit latus tertium: quod hic semper est quadrante minus. Verbi gratia. Si datum sit latus ◡AC, quæratur autem angulus ◡ABC.

AB,35.gr.40'.	*Idem 35.*	*40.*	
BC,54.	*20.compl.35.*	*40.*	
AF,90.	*0. DN,71.*	*20.*	*DP,9473966.*
AC,38.	*54'.19''.*		*DT,4736983.*
51.	*5'.41''.*		*LP,7781857.*
			DL,1692109.

Vt DT, 4736983. ad DE, 10000000, ita DL, 1692109. ad DC, 3572124, quo subtracto de DE, 10000000, relinquitur CE, 6427876, sinus arcus 40. gr. cujus complementum 50. gr. est angulus ◡ABC, quæsitus.

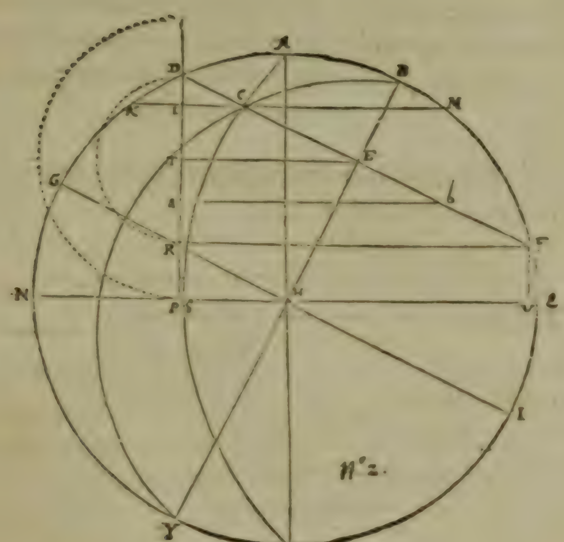
Secundum genus exemplorum: ubi datis duobus lateribus conjunctim quadrante minoribus, unà cum angulo ab ipsis comprehenso, quæritur latus tertium: vel contra, dato etjam latere tertio, quæritur angulus ipsi oppositus: secundum schema, Num. 2.

I. Si angulus datus sit rectus: ejusq; sinus versus DE.

AB,28.gr.15'.	*Idem 28.gr.15'.*			
BC,40.	*30. Compl.40.*	*30.*		
AF,68.	*45.*	*DN,77.*	*45.*	*DP,9772311.*
FQ,21.	*15.*	*FV, vel PR, vel Dr,*		*3624380.*
				Pr,13396691.
				TP,6698345.

Sinus

Sinus arcus 42.gr.3'.15". cujus complementum 47.gr.56'.45". est arcus ◡AC, quæsitus.



II. Si angulus datus sit acutus: ejusq; sinus versus DC.

AB, 26.gr.20'. Idem 26.gr.20'.
BC, 59.58. Compl.30. 2.

AF, 86.18. DN. 56.22. DP, 8325991.
3.42. — — — VF, 645323.
DR, 7680668.
DT, 3840334.

◡ABC, 50. 4.	10000000.	
39. 56.	6418958.	
	DC, 3581042.	

Vt DE, 10000000. ad DT, 3840334. ita DC, 3581042. ad DL, 1375239, quo ſubtracto de Dp 8325991. relinquitur LP, 6950752. ſinus arcus 44. gr. 2'. cujus complementum 45. gr. 58. m. eſt arcus ◡AC, quæſitus.

III. Si angulus datus ſit obtuſus: ejuſq; ſinus verſus Db.

AB, 26. 20.	Idem 26. 20.	
BC, 45. 58.	Compl. 44. 2.	
AF, 72. 18.	DN, 70. 22.	DP, 9418621.
FQ. 17. 42.	— — —	VF, 3040331.
		DR, 6378290.
◡ABC, 112. 35.		DT, 3189145.
90. 0.	DE, 10000000.	
22. 35.	Eb, 3840267.	
	Db, 13840267.	

Vt DE, 10000000. ad DT, 3189145, ita Db, 13840267. ad Da, 4413861: quo ſubtracto de DP, 9418621. relinquitur aP, 5004760. ſinus arcus 30. gr. 1'. 53''. cujus complementum 59. gr. 58'. 7''. eſt arcus ◡AC, quæſitus.

IV. Si datum ſit latus tertium: quod etiam in hoc genere exemplorum ſemper eſt quadrante minus. Verbi gratia. Si datum ſit latus ◡AC, quæratur autem angulus ◡ABC.

◡AB,

AB, 26.20.	*Idem 26.20.*	
BC, 59.58.	*Compl. 30. 2.*	
AF, 86.18.	*DN. 56.22.*	*DP, 8325991.*
3.42.	— — —	*VF, 645323.*
		DR, 7680668.
AC, 45.58.		*DT, 3840334.*
44.2.	— — —	*LP, 6950752.*
		DL, 1375239.

Vt DT, 3840334. ad DE, 10000000, ita DL, 1375239. ad DC, 3581042. ſinum verſum: quo ſubtracto de DE, 10000000. relinquitur CE, 6418958. ſinus rectus anguli CBE. 39. gr. 56'. cujus complementum 50. grad. 4. m. eſt angulus ◡ABC, quaſitus.

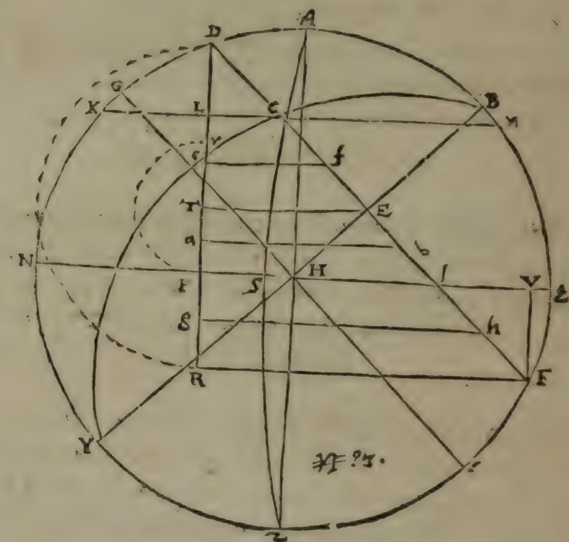
Tertium genus exemplorum: ubi datis duobus lateribus conjunctim quadrante majoribus, unà cum angulo ab ipſis comprehenſo, quæritur latus tertium: vel contra; dato etjam latere tertio, quæritur angulus ipſi oppoſitus, ſecundum ſchema, Num. 3.

I. Si angulus datus ſit rectus, ejuſq; ſinus verſus DE.

AB, 40. 6.	*Idem 40. 6.*	
BC, 72.12.	*Compl. 17. 48.*	
AF, 112.18.	*DN, 57.54.*	*DP, 8471219.*
QF, 22.18.	*VF, vel PR, vel*	*Dr, 3794562.*
		rP, 4676657.
		TP, 2338328.

Sinus arcus 13. gr. 31'. 22''. cujus complementum ◡AC, 76. gr. 28'. 38''. eſt latus tertium quaſitum.

II. Si angulus datus sit acutus: ejusq; sinus versus DC.



AB, 45.58 *Idem* 45.58.
BC, 59.58. *Compl.* 30.2.

AF, 105.56. *DN*, 76.0. *DP*, 9702957.

QF, 15.56. — — — *VF*, 2745187.

DR, 12448144.

ABC, 28.14. *DE*, 10000000. *DT*, 6224072.
61.46. *CE*, 8810284.

DC, 1189716.

Vt DE,

Vt DE, 10000000. ad DT, 6224072. ita DC, 1189716. ad DL, 740458, quo ſubtracto de D P 9702957. relinquitur LP, 8962469, ſinus arcus 63. gr. 40'. 8''. cujus complementum 26. gr. 19'. 52''. eſt latus ◡AC, quæſitum.

III. Si angulus datus ſit obtuſus: eiuſq. ſinus verſus Db.

AB, 45. 58.	Idem 45. 58.		
BC, 59. 58.	Compl. 30.	2.	
AF, 105. 56.	DN, 76.	0.	DP, 9702957.
QF, 15. 56.	— —	—	VF, 2745187.
◡ABC, 112.	35.		DR, 12448144.
Exc. 22.	35. Db, 13840267.		DT, 6224072.

Vt DE, 10000000. ad DT, 6224072, ita Db. 13840267. ad Da, 8614282 quo ſubtracto de DP, 9702957. relinquitur a P, 1088675. ſinus arcus 6. gr. 15'. cujus complementum 83. gr. 45. m. eſt ◡AC, latus tertium quæſitum.

IV. Si angulus datus ſit obtuſus, ejuſq. ſinus verſus Db.

AB, 45. 58.	Idem 45. 58.		
BC, 59. 58.	Compl. 30.	2.	
AF, 105. 56.	DN, 76.	0.	DP, 9702957.
QF. 15. 56.	— —	—	VF, 2745187.
			DR, 12448144.
◡ABC, 170.			DT, 6224072.
90.			
Exc. 80.	Db, 19848077.		

Vt DE, 10000000. ad DT, 6224072, ita Db, 19848077 ad Dg, 12353586 de quo ſubtractus ſinus DP, 9702957 relinquit Pg, 2650629 ſinus arcus 15 gr. 22'. 14''. qui additus ad quadrantem 90. gr. conſtituit AC, latus tertium quæſitum, 105. gr. 22'. 14''.

NOTA.

NOTA. Si quartus numerus in hoc casu idem reperiatur cum sinu DP, quomodo reperiretur ex sinu verso: DI: indicio est, tertium latus esse quadrantem: quia nullum habet sinum complementi, vel excessus. Nam, si DP, subtrahas à DP, restat nihil.

V. Si latus tertium datum sit quadrante minus: ejusq; complementi sinus LP.

AB, 45.58	*Idem* 45.58.	
BC, 59.58.	*Compl.* 30. 2.	
AF, 105.56.	*DN*, 76.0.	*DP*, 9702957.
QF, 15.56.	— — —	*VF*, 2745187.
		DR, 12448144.
AC, 26.20.		*DT*, 6224072.
59.58.	— —	*LP*, 8962469.
		DL, 740488.

Vt DT, 6224072. ad DE, 10000000, ita DL, 740488. ad DC, 1189716, quo subtracto de DE, 10000000, restat CE, 8810284. sinus anguli CBE, 61.46. cujus complementum 28.14. est angulus ∠ABC, quæsitus.

VI. Si latus tertium datum sit quadrante majus: ejusq; excessus sinus Pg.

AB, 45.58.	*Idem* 45.58.	
BC, 59.58.	*Compl.* 30. 2.	
AF, 105.56.	*DN*, 76. 0.	*DP*, 9702957.
QF, 15.56.	— — —	*VF*, 2745187.

∠AC,

AC,105.gr. 22'. *DR,12448144.*

Exc. 15. 22. Pg,2650620. *DT,6224072.*

DP,9702957.

Dg,12353586.

Vt DT,6224072 ad DE,10000000, ita Dg,12353586 ad Dh,19848077 sinum versum anguli ABC, quæsiti 170. grad.

USUS PRÆCEDENTIUM AXIOMATUM.

Sive:

Manuductio, qua ostenditur, quomodo beneficio illorum quatuor axiomatum, quæ hactenus explicata sunt, quodlibet quæsitum in quovis Triangulo Sphærico, quam facillime reperiri possit.

Principio memento, Triangulum sphæricum aliud esse rectangulum, aliud obliquangulum. Et rectangulorum aliud habere tres, aliud duos, aliud unicum rectum.

Si igitur Triangulum sphæricum rectangulum habeat tres rectos: datis tribus illis rectis, etiam latera ipsorum data sunt: & contra, per 68 p.1.

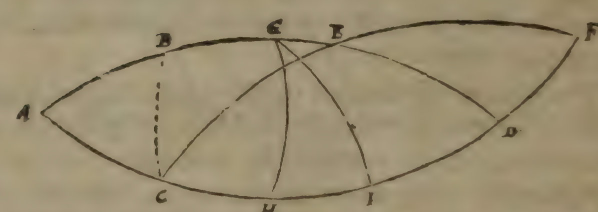
Si Triangulum sphæricum rectangulum habeat duos rectos: datis duobus illis rectis data sunt etiam duo latera, duobus illis rectis opposita: nempe duo quadrantes, per 68. p. 1. Quod si præterea etiam detur latus tertium, vel angulus tertius: dato horum alterutro, etiam alterum datum erit: cum latus tertium angulo tertio quadrantetenus oppositum, nihil aliud sit, quàm anguli illius mensura per 58 p.1.

In his igitur duobus casibus nulla Trigonometria est opus. At si Triangulum sphæricum rectangulum tantum unicum habeat rectum, cæteros duos obliquos, in eo casu Trigonometria sæpe requiritur.

Cum autem triplex sit hujusmodi Triangulum sphæricum rectangulum. Vel enim anguli reliqui duo ambo sunt acuti, vel ambo obtusi, vel alter obtusus, alter acutus, per 63. p. 1. Axiomata nostra, non nisi eorum solutionem ostendunt: quæ duos habent præter rectum acutos: ac proinde latera singula quadrantibus minora, per 65. p. 1.

Quod si igitur solvendum tibi detur Triangulum sphæricum rectangulum cum duobus obtusis: aut cum uno obtuso & altero acuto: aut cum lateribus duobus sigillatim quadrante majoribus: pro eo Triangulo solvas Triangulum minus ipsi oppositum. Ut

Si detur tibi solvendum Triangulum BDC, rectangulum ad D, & obtusangulum ad B & C, pro eo solvas Triangulum ◡ABC, Triangulo BDC, ex angulo D, oppositum. Quibuscunq; enim tribus in Triangulo BDC, datis: etiam tria in Triangulo ◡ABC, data erunt: cum an-



guli ad A & D, sint æquales per 59. p. 1. latera vero ◡AB & ◡AC, laterum BD & CD, obtusi deniq; ad B & C, acutorum ad B & C, complementa, per 60. & 21. p. 1.

Simi-

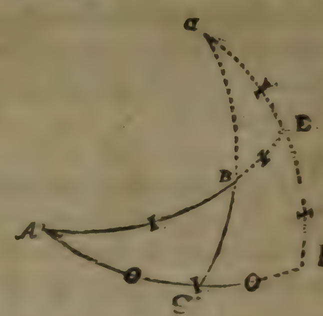
Similiter si detur tibi solvendum Triangulum CED, rectangulum ad D, obtusangulum ad E, & acutangulum ad C, pro eo solvas Triangulum EDF, Triangulo ECD, ex angulo C, oppositum.

Si verò solvendum tibi detur Triangulum sphæricum rectangulum, cum duobus acutis: aut cum lateribus omnibus sigillatim quadrante minoribus: in illo nihil quæri poterit: quod non beneficio paucissimorum nostrorum axiomatum: ex tribus quibuscunque datis unica, vel multiplicatione, vel divisione: aut interdum etiam sine omni, tàm multiplicatione, quàm divisione, per solam additionem, & subtractionem reperias: modo hoc observes: ut si in ipso Triangulo proposito idonea ad solutionem proportio inter data & quæsita non appareat, mox singula ejus latera, usque ad quadrantes continues: & totam figuram quadrante claudas. Id enim si feceris, in complementis datorum & quæsitorum laterum & angulorum certissimè reperies proportionem aliquam tuo instituto inservientem.

Verbi gratia. Si in Triangulo ◡ABC, ex datis latere ◡AB, & angulis BAC, & ◡ACB, quæratur latus ◡AC, quia nulla in his datis & quæsitis proportio apparet, cujus mentio facta sit in axiomatibus proportionum: ideò latera singula usque ad quadrantes continues, & totam figuram quadrante DF, claudas hoc modo.

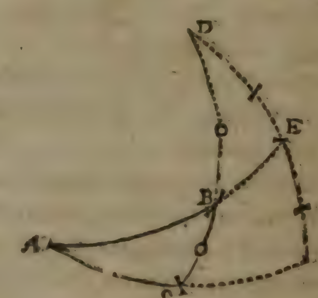
Qua continuatione facta in Triangulis BDE & CDF, apparet talis proportio: de quali actum fuit axiomate secundo. Per istud igitur axioma sic concludes:

Vt ſinus baſis DE, ad tangentem perpendiculi EB, ita ſinus quadrantis DF, ſive radius ad tangentem FC, cuius complementum eſt arcus AC, quæſitus.



Similiter, *Si in Triangulo ABC, dati ſint omnes anguli: quæratur autem perpendiculum BC, quia in his datis & quæſitis nulla apparet proportio: ſecundum noſtra quidem axiomata: ideo Triangulum ABC, continues hoc modo:*

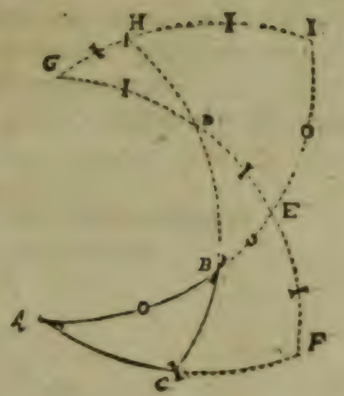
Quo facto erit in Triangulo DEB ut DBE ad DE, ita DEB ad DB, per axioma tertium: quo DB noto, notum eſt etiam ejus complementum BC.



Quod ſi prima continuatio non ſuffecerit: etiam ſecundam adhibeas licet: ut factum vides in hoc exemplo: ubi ad quærendam ex datis tribus angulis hypotenuſam prima continuatio non ſuffecit. Secundam igitur aſcivimus: hoc eſt: con-

continuavimus etjam Triangulum BDE, ut pridem continuaveramus Triangulum ABC, quo facto, apparuit eſſe,

Vt HI, tangens ad IB, radius ita DE, tangens ad EB ſinum, per axioma ſecundum, cuius BE, arcus complementum eſt hypotenuſa AB, quæſita.



DE OBLIQUANGULIS.

Atq; hæc de rectangulis. De obliquangulis ab initio idem ferè monendus es, quod de rectangulis: nempe, ſi ſolvendum tibi detur Triangulum obliquangulum, laterum ſigillatim quadrantibus majorum: pro eo ſolvas Triangulum ipſi oppoſitum: quod laterum ſit ſigillatim quadrantibus minorum. Quam oppoſitionem didiciſti lib. 1. prop. 60. Nam axiomata proportionum noſtra: etſi quodammodo generalia eſſe poſſint: præcipuè tamen accommodata ſunt ad ea Triangula, quorum latera ſingula, vel certè duo principalia (quæ nimirum angulum datum, aut quæſitum includunt) ſigillatim ſint quadrantibus minora.

Horum igitur quædam abſq; reductione ad rectangula ſolvi poſſunt: quædam abſq; reductione ad rectangula ſolvi non poſſunt.

Abſque reductione ad rectangula ſolvi poſſunt, quæ tertio, vel quarto proportionum axiomati conveniunt. Tertio proportionum axiomati conveniunt, in quibus, vel ex datis duo-

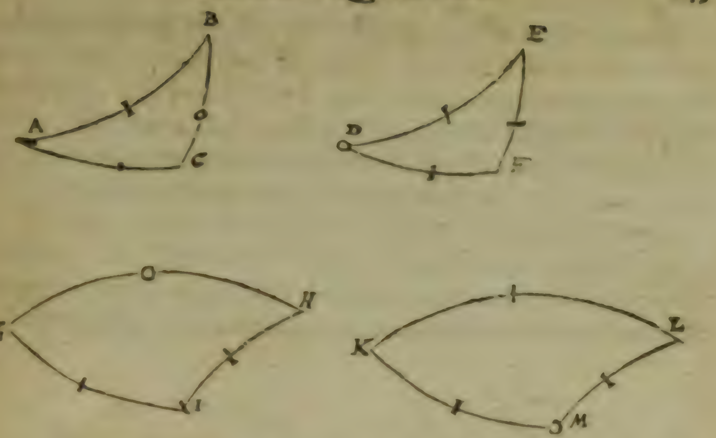
bus lateribus cum angulo uni eorum oppoſito, angulus alteri eorum oppoſitus: vel contra ex datis duobus angulis, cum latere uni eorum oppoſito, latus alteri eorum oppoſitum inquiritur. Ut in iſtis:

In quibus eſt: ut GIH, ad GH, ita HGI ad HI.
Et ut KL ad KML, ita KM, ad
KLM.

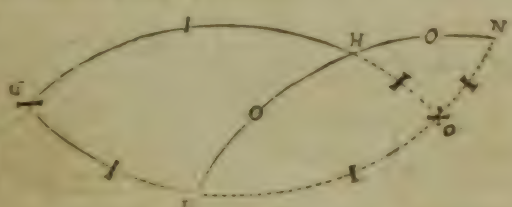
Quarto proportionum axiomati conveniunt, quædam per ſe, quædam per accidens.

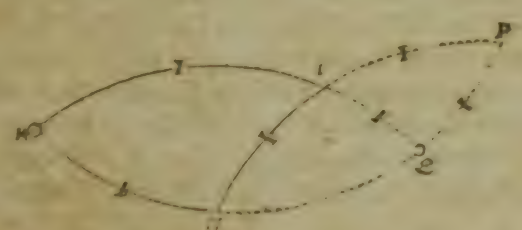
Quarto proportionum axiomati per ſe conveniunt: in quibus, vel ex datis duobus lateribus ſigillatim quadrante minoribus, unà cum angulo ab ipſis comprehenſo, latus tertium: vel contra ex datis omnibus tribus lateribus, angulus quiſpiam à duobus lateribus ſigillatim quadrante minoribus, comprehenſus, inquiritur. Ut in iſtis:

In



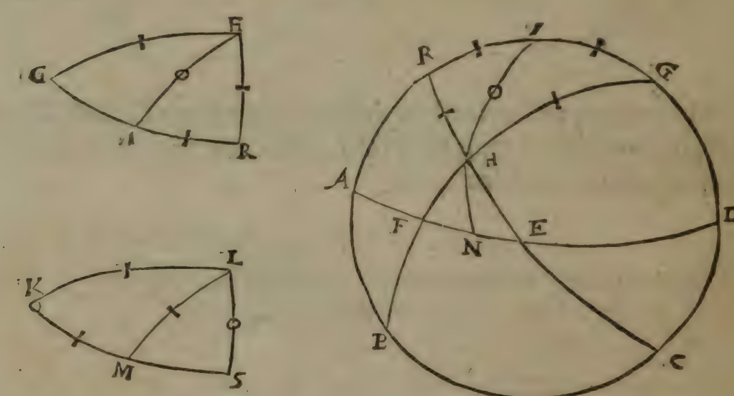
In quorum poſterioribus duobus: quæ latus GH & KL, habent quadrante majus : ſi talis inſtituatur inquiſitio, qualem ſequentes notæ indicant.





Quia sic duo latera angulum datum, vel quæsitum includentia non sunt utraque sigillatim quadrantibus minora: ut axioma quartum requirit. Pro Triangulo GHI vel KLM, solvas Triangulum HNO vel LPQ, in quo utrovis, duo latera angulum datum, vel quæsitum includentia juxta præceptum quarti axiomatis, sigillatim sunt quadrantibus minora.

Quod si latus GH vel KL, sit quadrans: non necesse est, ut solvas Triangulum obliquangulum GHI vel KLM. Sed solvere poteris rectangulum, quod tali obliquangulo semper adjacet: ut ex sequentibus tribus schematibus apparet.



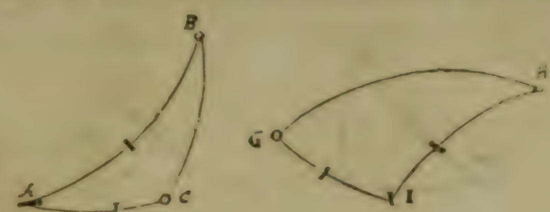
In quibus si latus minus GI vel KM continues usq; ad quadrantem GR vel KS, in Triangulis GHR & KLS, anguli ad H & R, item ad L & S, erunt recti, per 68. p. 1. & latus HR, vel LS, erit mensura anguli ad G vel K, per 58. p. 1. adeoque existet inde rectangulum IHR, vel MLS, trium datorum; quo rectangulo soluto, etiam obliquangulum illi adjacens (quippe quod complementa rectanguli contineat) solutum erit.

His

His obſervatis, quartum axioma ſufficiet: neq; opus erit, ut ad ſingulos obliquangulorum caſus ſingula axiomata fabricemus: quod alioqui fieri poterat.

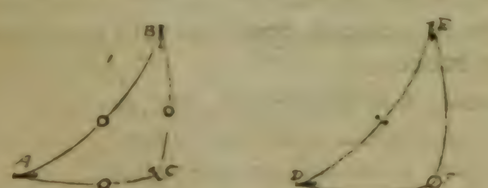
¶ Sed & illud hoc loco tenendum eſt: Si data quidem obliquanguli propoſiti ad quartum axioma congruant: quæſitum verò non item: Ut in iſtis.

In quorum primo quæritur angulus ad B vel C, in altero, angulus ad G vel H, principio latus BC vel GH, quærendum eſſe per axioma quartum: deinde ex illo invento, anguli quicunq; reliqui per tertium.



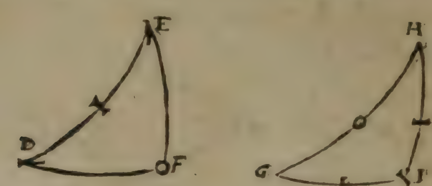
Atque hæc de illis obliquangulis, quæ quarto proportionum axiomati per ſe conveniunt.

¶ Quarto proportionum axiomati per accidens conveniunt: in quibus, vel ex datis tribus angulis latus aliquod, vel ex



datis duobus angulis cum latere ipſis interjacente tertius angulus inquiritur, ut in iſtis.

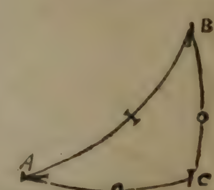
Quæ propterea dico per accidens convenire quarto axiomati: quia non aliter ipſi conveniunt: quam quatenus latera in angulos, & contra anguli in latera permutantur: quòd qua conditione fieri poſſit, oſtendimus lib. 1. prop. 61. quam propoſitionem qui penitus intellexerit, & animo probè infixerit, nihil hic præterea deſiderabit. In tyronum tamen gratiam, qui præcipua præceptionum momenta non ſemper obſervant, id hic repeto & inculco: in hac permutatione angulorum & laterum, pro latere maximo & angulo ipſi oppoſito ſemper complementa ad ſemicirculum eſſe ſumenda; propter cauſas ad dictam prop. 61. libri 1. oſtenſas. *Exempli gratia.*



Si in Triangulo DEF, angulos in latera & contra permutaveris, Triangulum inde tale exiſtet, quale eſt GHI. Vnde apparet ad calculum aſſumendum eſſe non ſinum verſum lateris DE, ſed complementi ad ſemicirculum: quod complementum reſpondet obtuſo HIG.

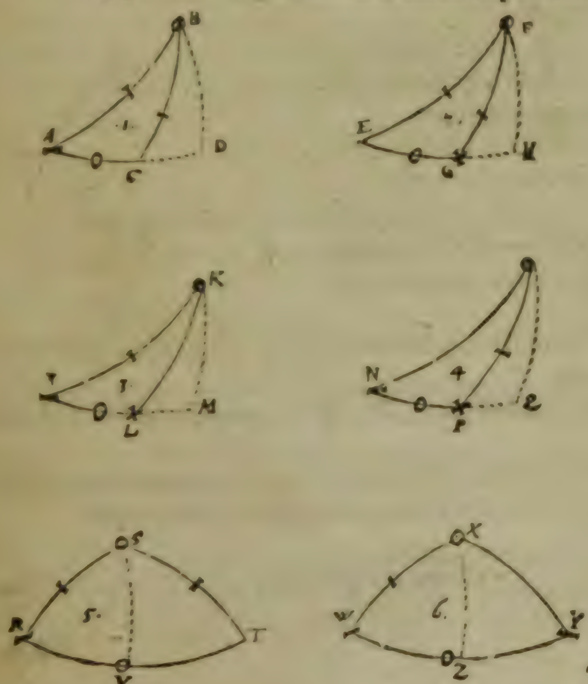
Cæterùm, quòd de illis obliquangulis monuimus, quæ per ſe quarto axiomati conveniunt: nempe, ſi data quidem axiomati quarto conveniant, quæſitum verò non item; id etiam hic locum habet.

Verbi gratia. Si in obliquangulo ◡ABC, ex datis angulis ad ◡A & B, unà cum latere AB, inquirendũ ſit latus AC vel BC, principiò quæras oportet angulum ACB, per axioma quartum: & tum deniq; latus AC vel BC, per axioma tertiũ.



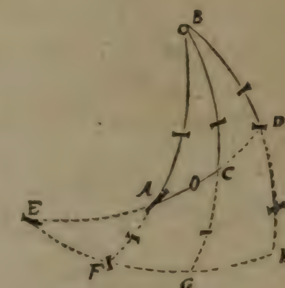
Reſtant illa obliquangula; quæ neq; tertio, neq; quarto propor-

proportionum axiomati conveniunt. In quibus nempe, vel ex datis duobus lateribus, & angulo uni eorum opposito, angulus neutri eorum oppositus, aut latus angulo ignoto oppositum: vel contra, ex datis duobus angulis, & latere uni eorum opposito, latus neutri eorum oppositum, aut angulus lateri ignoto oppositus inquiritur. Hæc solvi non possunt, nisi ad rectangula reducantur. Ad rectangula autem reducuntur, per dimissionem perpendiculi. Quod perpendiculum, vel extra, vel intra Triangulum cadit. Extra Triangulum cadit: si dimittatur ab angulo acuto. Intra Triangulum cadit, si dimittatur ab angulo obtuso. Utcunq; autem cadat: semper angulo noto opponitur: & per axioma tertiũ reperitur, hoc modo.



1. *Vt ADB,ad AB,ita DAB ad DB.*
2. *Vt GHF,ad GF,ita HGF,ad HF.*
3. *Vt IMK,ad IK,ita MIK,ad MK.*
4. *Vt PQO,ad PO,ita OPQ,ad OQ.*
5. *Vt RVS,ad RS,ita VRS,ad VS.*
6. *Vt WZX,ad WX,ita ZWX,ad ZX.*

Inventis autem perpendiculis BD, FH, KM, &c. in omnibus istis obliquangulis habentur bina rectangula trium datorum : *Verbigratia. In primo genere ABD & DCB : in secundo, EFH, & GFH, & ita deinceps.* Quorum rectangulorum beneficio, quicquid in obliquangulis adjunctis requiritur, facilimè reperitur : præsertim, si latera singula usq; ad quadrantes continuentur : hoc modo.



Qua continuatione facta: Si ex datis AB, BC, BAC, quæram AC, dico per axioma primum.

I. Vt HD, ad DE, ita FA, ad ◡AE, quo subtracto de ED restat ◡AD.

II. Vt HD, ad DE, ita GC ad CE, cuius complementum est CD, quo subtracto de ◡AD, restat arcus ◡AC, quæsitus.

Sin ex iisdem datis quæram angulum ABC, dico : per axioma secundum.

I. Vt DH, ad HE, ita ◡AF, ad FE : quo subtracto de EH, restat FH.

II. Vt DH, ad HE, ita CG, ad GE, cujus complementum est GH, quo subtracto de FH, restat FG, mensura anguli ◡ABC, quæsiti.

Cætera usus te docebit.

BAR-

BARTHOLOMÆI
Pitiſci Grunbergenſis
TRIGONOMETRIÆ,
Liber Quintus.

De compendiis & varietatibus calculi Trigonometrici.

Superioribus quatuor libris neceſſaria Trigonometriæ præcepta perſecuti ſumus. Quinto hoc, & poſtremo libro, de compendiis & varietatibus calculi Trigonometrici quædam trademus: quæ, etſi neceſſaria non ſunt: uſum tamen habent in Trigonometria perjucundum.

Compendia calculi Trigonometrici præcipua ſex ſunt.

COMPENDIUM PRIMUM.

In regula proportionum: in qua ſemper debent eſſe tres termini dati:

Si primo loco ſit radius, ſecundo & tertio ſinus, & multiplicationem & diviſionem evitare.

Regula. Pro duobus præter radium datis ſinibus: ſume arcuum ſinibus iſtis reſpondentium complementa: & habebis triangulum ſphæricum rectangulum, quarto Triangulo-

rum ſphæricorum axiomati accommodatum: atq; adeo per ſolam proſthaphæreſin ſolubile.

Exempli gratia: ſi detur talis propoſitio: Vt radius AE, ad ſinum EF: ita ſinus AB, ad ſinum BC.

Pro datis ſecundo & tertio loco arcubus AB, & EF, ſume eorum complementa BE, & ED, & habebis triangulum BED, rectangulum ad E, cujus beneficio quæſitum BC, complementum lateris DB, per quartum axioma ſphæricorum ſine omni multiplicatione & diviſione inveneris.

Sit jam latus AB,	*42. gr.*
latus EF,	*48. gr. 25'.*
Ergo erunt latus BE,	*48 gr.*
latus DE,	*41. gr. 35'.*

Quibus habitis ita procedo.

DE, 41.	*35'.*	*Idem 41. gr. 35'.*	
BE, 48. gr.	*0'.*	*Compl. 42. gr. 0'.*	
89.	*35.*	*83. gr. 35'.*	*ſin. 9937354.*
0.	*25.*	*— —*	*ſin. 72721.*
			10010075.
			5005037.

Sinus arcus quæſiti BC, 30. gr. 2'.

COMPENDIUM SECUNDUM.

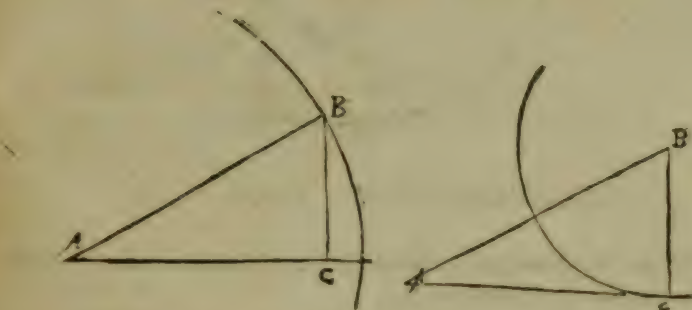
Si primo loco ſit ſinus: ſecundo, vel tertio radius: radio in primum locum retracto, diviſionem evitare.

REGULA.

REGULA. Pro ſinu, primo loco poſito, ſubſtitue ſecantem complementi: & negocium confectum erit.

Nam, ut ſinus ad radium: ita radius ad ſecantem complementi: v.g.

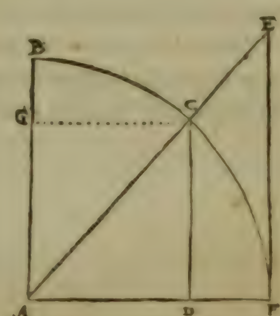
Vt BC, ſinus anguli BAC, ad ◡AB radium, ita BC, radius ad ◡AB, ſecantem complementi ◡ABC, per primum planorum.



Idem etiam ſic demonſtrari poteſt.

Vt ◡AD, ſinus anguli ◡ACD, ad ◡AC, radium, ita ◡AF, radius ad AE ſecantem complementi CAD.

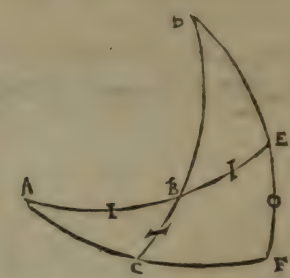
EXEMPLUM. *Sit data hæc proportio. Vt ſinus arcus ◡AB, 42. gr. ad ſinum arcus BC, 30. grad. 2'. ita ſinus arcus ◡AE, hoc eſt, radius ad ſinum arcus EF.*



Pro ſinu arcus ◡AB, 42. gr. ſume ſecantem complementi 48. grad. & proportio ita habebit.

Vt radius

Vt radius 10000000. ad ſecantem 48. grad. 14944765. ita ſinus arcus BC, 30 grad. 2'. nempe 5005037. ad ſinum arcus EF, 7479910. 48. grad. 25'.

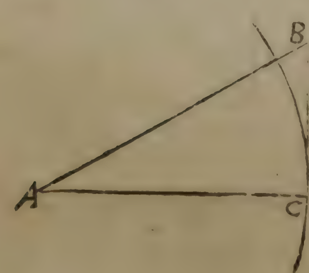


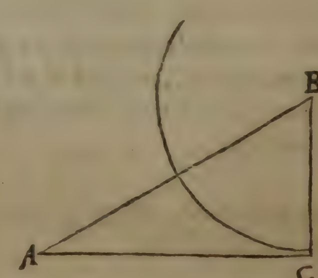
COMPENDIUM TERTIUM.

Si primo loco ſit tangens: ſecundo, vel tertio radius: radio in primũ locum retracto diviſionem evitare.

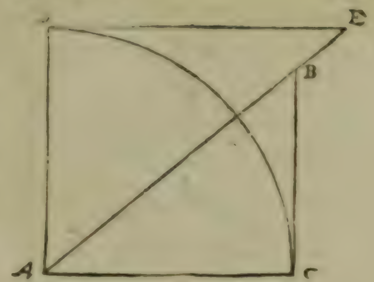
REGULA. Pro tangente primo loco poſitâ, ſubſtitue tangentem complementi: & voti compos eris.

Nam, ut tangens ad radium: ita radius ad tangentem complementi: v.g. ut BC, tangens anguli BAC, ad AC radium: ita BC, radius ad AC, tangentem complementi ABC, per primum planorum.





Idem



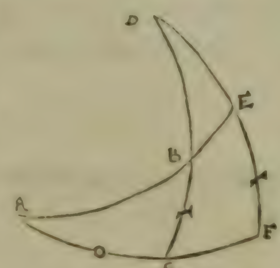
Idem etiam sic demonstrari potest.

Vt BC, tangens ad ◡AC, radium, ita ◡AD, radius ad DE tangentem complementi.

EXEMPLUM. *Sit data hæc proportio: ut tangens EF, 48. gr. ad radium ◡AF, ita tangens BC 30. gr. 2'. ad sinum ◡AC.*

Pro tangente EF 48. gr. 25'. substitue tangentem complementi 41. grad. 35'. Et habebis talem proportionem.

Vt radius 10000000. ad tangentem 41 grad. 35'. 8873215, ita tangens BC, 30. gr. 2'. 5781262, ad sinum ◡AC, 5129838. 30 gr. 51'. 46".

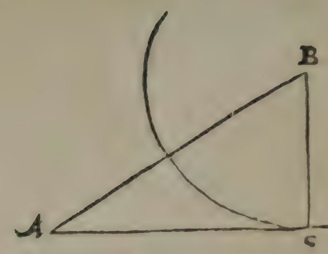


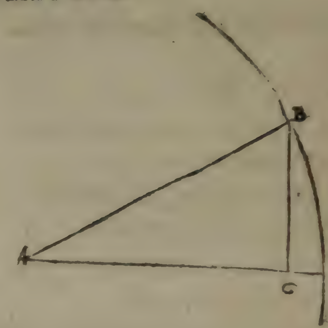
COMPENDIUM QUARTUM.

Si primo loco sit secans: secundo, vel tertio radius: radio in primum locum retracto, divisionem evitare.

REGULA. Pro secante primo loco positâ, substitue sinum complementi: & habebis proportionem, in qua radius sit primo loco.

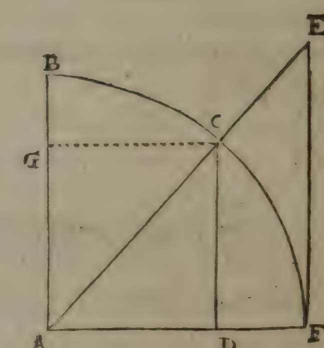
Nam, ut secans ad radium: ita radius ad sinum complementi, v. g. ut ◡AB, secans anguli ABC, ad BC, radium: ita AB, radius ad BC, sinum complementi BAC, per primum planorum.





Idem etiam sic demonstrari potest.

Vt secans ◡AE, ad radium AF, ita radius ◡AC, ad sinum complementi ◡AD.



COMPENDIUM QUINTUM.

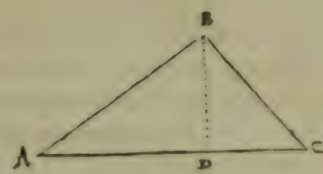
Si primo loco sit sinus: nusquam radius: divisionem per sinum primi loci faciendam, in multiplicationem convertere.

REGULA. Pro sinu primi loci, substitue secantem complementi: & problemati satisfactum erit.

Nam,

Nam, si detur talis proportio:

Vt AB, sinus anguli ACB, ad BC, sinum anguli BAC, ita AB latus, ad BC latus.



Dimisso perpendiculo BD: eodem effectu dixeris:

1. Vt AB radius ad BD, sinum anguli BAC, ita AB latus, ad BD latus.

2. Vt BD radius ad BC, secantem anguli DBC, complementi anguli ACB vel DCB, ita BD latus, ad BC latus. per prim. planorum.

COMPENDIUM SEXTUM.

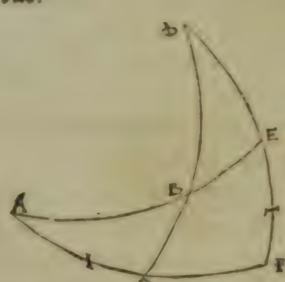
Si primo loco sit radius: secundo, & tertio mixtim sinus & tangentes, vel secantes: per solam prosthaphæresin problema solvere.

REGULA. Tangentes & secantes habe pro sinibus: & exemplum quadrabit ad compendium primum.

Quod si tangens, aut secans habeat plures, quàm septem cyphras: ultimas septem cyphras habe pro sinu: per primam vero cyphram, aut, si plures sint, per primas, multiplica alterius dati sinum, & productum adde ad inventum compendii primi: hoc modo:

Sit data talis proportio.

Vt radius AF, ad tangentem EF, anguli EAF, 48 gr. 25'. quæ tangens est, 11269872, ita sinus arcus AC (qui arcus est 30 gr. 51'. 46".) 5129837. ad tangentem arcus BC.



Tangentis 11269872. ultimas ſeptem cyphras 1269872. habe pro ſinu: & illi ſinui competentem arcum de canone deſume 7.grad. 17'.44''. Tumq; ita procede per compendium primum.

Arcus 7.gr.17'.44''. complementum eſt 82.gr.42'.16''.

Arcus 30.gr. 51'.46''. complementum eſt 59.gr. 8'. 14''.

Ergo ſecundum quartum ſphæricorum.

Latus minus eſt 59.gr. 8'.14''.	*Idem 59.gr. 8'.14''.*	
Latus majus eſt 82.gr.42'.16.	*Compl. 7.gr.17'.44''.*	
exc. 51.50.30.	*66. 25. 58.*	*ſin. 9165916.*
		ſin. 7863064.
		1302852.
	Inventum compendii primi	*651426.*
	Cui adde ſinum alterius dati	*5129837.*

Et emerget --- quæſita tangens arcus BC,30.grad. 2 - 5781263.

NOTA. *Si data tangens talis eſſet : 21269872. poſt praxin compendii primi, per ultimas ſeptem cyphras 1269872. multiplicares ſinum alterius dati, 5129837. per 2.& productum adderes ad inventum compendii primi 651426.*

Si vero data tangens talis eſſet : 31269872. poſt praxin compendii primi per ultimas ſeptem cyphras 1269872. multiplicares ſinum alterius dati, 5129837. per 3. Si deniq; ante ſeptem ultimas eſſet 4. multiplicares 5129837. per 4. ſi 5. ſi 6. per 6. ſi 12. per 12. ſi 213. per 213. Et ſic deinceps.

Cauſa eſt : quia totus ſinus 5129837. erat per totam tangentem, 11269872. multiplicandus.

Atqui per uſum compendii primi ſinus 5129837. erat tantum multiplicatus per 1269872. Ergo reſtabat multiplicatio per 1. vel 2. vel 3. vel per quicquid ante illas ſeptem cyphras 1269872 præceſſerit. Ideo autem factus per 1. & 5129837. directe ſub inventum compendii primi, 651426. ſubſcribitur : quia illud inventum eſt productum multiplica- tionis

tionis sinuum, 5129837. & 1269872, radio divisum. Quod productum ita staret, si radio divisum non esset.

6514260000000.

Quia igitur postremus multiplicator 1. est octavo loco, sinistram versus; ideo etiam productum eius multiplicatoris, 5129837. necessario sic subscribitur, ut ultimus ejus numerus sit octavo, penultimus nono loco, & ita deinceps: hoc nempe modo,

6514260000000.

5129837. —

COMPENDIUM SEPTIMUM.

Qualiacunque sint data: per solam prosthaphæresin quæsitum invenire.

REGULA. Ut semper radium habeas primo loco: effice per compendium secundum, tertium, quartum vel quintum. Deinde cętera perage per compendium primum aut sextum.

De Varietatibus calculi Trigonometrici, in genere.

In solutione triangulorum, præcipuè sphæricorum, sæpè unum idemque quæsitum, ex iisdem datis, pluribus diversis modis inveniri potest. Cujus rei causæ sunt quatuor: quas singulas singulis theorematibus explicabimus.

Varietatis calculi Trigonometrici theorema primum.

Omnis proportio radii ad sinum, tangentem, aut secantem: & contra: tripliciter variari potest, per primum axioma planorum.

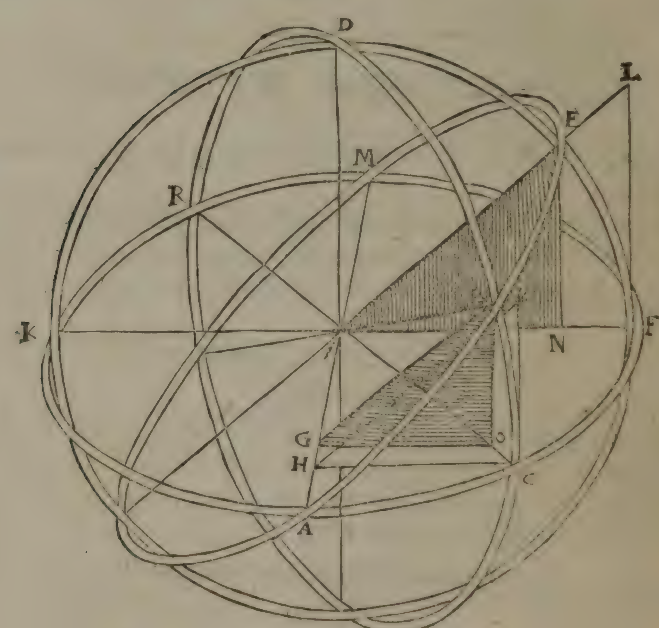
Ergo in triangulo sphærico rectangulo ABC, si ex datis BAC, 48. gr. 25'. & AB, 42. gr. quærendus sit arcus BC. Quia datur hæc proportio.

Vt AE, radius ad EF, ſinum: ita AB, ſinus ad BC, ſinum per primum ſphæricorum.

Hoc eſt

Quia in triangulo plano GBO, per iſta duo data BAC, & ◡AB, dantur omnes anguli & inſuper latus GB, ſinus nempe arcus ◡AB. Latus BO, ſinum arcus BC, tripliciter invenire poſſum.

Nempe vel ſic:



Vt GB, radius	—	—	10000000.
ad BO, ſinum anguli BAC vel BGO.	—		7479912.
ita GB, ſinus arcus ◡AB,	—		6691306.
ad BO, ſinum arcus BC.	—		5005038.

Vel

Vel sic.

Ut GB, secans anguli BGO, —	15066852.
ad BO, tangentem ejusdem anguli, —	11269872
Ita GB, sinus arcus ◡*AB,* —	6691306.
ad BO, sinum arcus BC, —	5005038.

Vel deniq; sic.

Ut GB, secans anguli GBO, —	13369141.
ad BO, radium — —	10000000.
ita GB, sinus arcus ◡*AB,* —	6691306.
ad BO, sinum arcus BC, —	5005038.

¶ *Sic in eodem triangulo sphærico ABC, si ex datis BAC, 48. grad. 25'. & ◡AC, 30. grad. 51'. 40". quæratur arcus BC. Quia datur hæc proportio.*

Ut AF, radius ad EF, tangentem: ita AC, sinus ad BC, tangentem: per secundum sphæricorum.

Hoc est:

Quia in triangulo plano HPC, per ista duo data, BAC & AC, dantur omnes anguli, & insuper latus ◡AC, latus PC: tangentem anguli BAC, vel PHC, tripliciter invenire possum. Nempe, vel sic: posito latere HC, pro radio.

Ut HC, radius — —	10000000.
ad PC, tangentem anguli PHC, —	11269872.
ita HC, sinus arcus HC, —	5129838.
ad PC, tangentem arcus ◡*AC,* —	5781202

Vel sic: posito latere PC, pro radio.

Ut HC, tangens anguli HPC, —	8873215.
ad PC, radium — —	10000000.
ita HC, sinus arcus ◡*AC,* —	5129838.
ad PC, tangentem arcus BC, —	5781202.

Vel

Vel deniq; sic: posito latere HP, pro radio.

Vt HC, sinus anguli HPC,	—	6637087.
ad PC, sinum anguli PHC,	—	7479912.
ita HC, sinus arcus ◡AC,	—	5129838.
ad PC, tangentem arcus BC,	—	5781262.

Varietatis calculi trigonometrici theorema secundum.

In regula proportionum, in qua semper sunt quatuor termini, tres dati, quartus quæsitus: perinde est, utrum duorum terminorum intermediorum secundo, vel tertio loco ponam.

Perinde enim est, sive dicam:

Vt 2. ad 4. ita 5. ad 10.

Sive

Vt 2. ad 5. ita 4. ad 10.

Hinc quodlibet exemplum primi theorematis rursum tripliciter variare possum.

Primum exemplum primi theorematis hoc erat:

Vt radius	— — —	10000000.
ad sinum anguli BAC,	—	7479912.
ita sinus arcus ◡AB,	— —	6691306.
ad sinum arcus BC,	— —	5005038.

Pro eo nunc ita dicam: adhibita rursus varietate theorematis primi.

Vel: ut radius	— — —	10000000.
ad sinum arcus ◡AB,	—	6691306.
ita sinus anguli BAC,	— —	7479912.
ad sinum arcus BC,	— —	5005038.

Vel:

Vel: ut ſecans arcus AB, —	13456327.
ad tangentem ejuſdem —	9004040.
ita ſinus anguli BAC, —	7479912.
ad ſinum arcus BC, —	5005038.

Vel deniq;: ut ſecans complementi arcus AB,	14944765.
ad radium — —	10000000.
ita ſinus anguli BAC, —	7479912.
ad ſinum arcus BC, —	5005038.

¶ *Secundum exemplum primi theorematis hoc erat:*

Vt radius — — —	10000000.
ad tangentem anguli BAC, —	11269872
ita ſinus arcus AC, —	5129838.
ad tangentem arcus BC, —	5781262.

Pro eo nunc ita dicam: adhibitâ ſimul varietate theorematis primi.

Vel: ut radius — —	10000000.
ad ſinum arcus AC, — —	5129838.
ita tangens anguli BAC, —	11269838.
ad tangentem arcus BC, —	5781262.

Vel: ut ſecans arcus AC, —	11649603.
ad tangentem ejuſdem — —	5976055.
ita tangens anguli BAC, —	11269838.
ad tangentem arcus BC, —	5781262.
Vel deniq;: ut ſecans complementi arcus AC,	19493797.
ad radium — —	10000000.
ita tangens anguli BAC, —	11269838.
ad tangentem arcus BC, —	5781262.

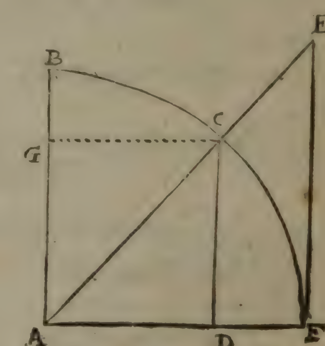
Varietatis calculi trigonometrici theorema tertium.

Sinus arcuum & ſecantes complementorum reciprocè ſunt proportionales.

Hoc eſt, ut ſinus arcus majoris ad ſinum arcus minoris: ita ſecans complementi arcus minoris, ad ſecantem complementi arcus majoris. Et viciſſim. Vt ſinus arcus minoris, ad ſinum arcus majoris: ita ſecans complementi arcus majoris ad ſecantem complementi arcus minoris.

Cauſa hujus reciprocationis eſt:

Quia radius eſt media proportione inter ſinum arcus & ſecantem complementi, *hoc eſt, Vt ſinus ſe habet ad radium: ita radius ad ſecantem complementi v. g.*



Vt AD, ſinus arcus BC, ad radium AC, ita radius AF ad AE, ſecantem complementi CF, per 4 ſexti Euclidis: ſive per 46. primi noſtri.

Ergo unuſquiſq; ſinus in ſecantem complementi ductus, efficit quadratum radii.

Ac proinde plana ex ſinibus arcuum & ſecantibus complementorum facta, omnia inter ſeſe ſunt æqualia: quia ſcilicet uni quadrato radii ſunt æqualia.

Atqui plana æqualia, habent latera reciprocè proportionalia per 42. primi noſtri.

Ergo, ut ſinus arcus majoris, ad ſinum arcus alicujus minoris: ita ſecans complementi arcus minoris, ad ſecantem complementi arcus majoris.

In parvis numeris hoc totum cernere perfacile eſt. Sint enim ſinus duo: 4. & 2. radius 10. Principio manifeſtum eſt, ſecantes complementorum fore 25. & 50.

Nam

Nam:

Vt 4. ad 10. ita 10. ad 25.

Vt 2. ad 10. ita 10. ad 50.

Deinde manifestum est, esse secantem complementi 2, ad secantem complementi 4, ut 4. ad 2. Nam secans complementi 2. est 50. secans complementi 4. est 25. Vt autem 4. ad 2. ita 50. ad 25.

In numeris majoribus est eadem ratio. Sint enim dati duo sinus 6691306. & 5005038. & quærantur secantes complementorum, hoc modo.

Vt 6691306. ad 10000000.
ita 10000000. ad 14944765.

Vt 5005038. ad 10000000.
ita 10000000. ad 19979868.

Manifestum est, post istam inquisitionem esse:

Vt 6691306. ad 5005038.
ita 19979868. ad 14944765.

Hinc primum exemplum primi theorematis rursum sextupliciter variare possum.

Nam si ex primo theoremate assumam proportionem istam.

Vt radius 10000000. ad sinum anguli BAC, 7479912. Inversa illa proportione dicam per hoc tertium theorema: adhibita simul varietate theorematis primi.

Vel: ut sinus anguli BAC,	—	*7479912.*
ad radium	— —	*10000000.*
ita secans complementi arcus AB,	—	*14944765*
ad secantem complementi arcus BC,		*19979868*

Vel: ut tangens anguli BAC,	—	*11269872*
ad secantem ejusdem	—	*15066852.*
ita secans complementi arcus AB,		*14944765.*
ad secantem complementi arcus BC,		*19979868.*

Vel deniq; ut radius	— —	10000000.
ad secantem complementi anguli BAC,		13369141.
Ita secans complementi arcus AB,	—	14944765
ad secantem complementi arcus BC,		19979868.

¶ *Si vero ex secundo theoremate assumam proportionem istam.*

Vt radius 10000000 ad sinum arcus ◡AB, 6691306. Inversa illa proportione dicam per hoc tertium theorema: adhibitâ simul varietate theorematis primi.

Vel: ut sinus arcus ◡AB,	—	6691306.
ad radium	— —	10000000.
ita secans complementi anguli BAC,	—	13369141.
ad secantem complementi arcus BC		19979868.
Vel: ut tangens arcus AB,	—	9004040.
ad secantem ejusdem,	—	13456327.
ita secans complementi anguli BAC,	—	13369141.
ad secantem complementi arcus BC,		19979868.
Vel deniq;: ut radius,	— —	10000000.
ad secantem complementi AB,	—	14944765
ita secans complementi anguli BAC,	—	13369141.
ad secantem complementi arcus BC,		19979868

Ita arcum BC, ex iisdem datis BAC, & AB, duodecies invenero: ter per primum: & iterum ter per secundum: & deniq; sexies per tertium theorema.

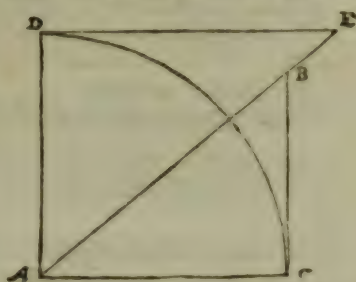
Varietatis calculi Trigonometrici theorema quartum.

Tangentes arcuum & tangentes complementorum reciprocè sunt proportionales.

Hoc est: ut tangens arcus majoris ad tangentem arcus minoris: ita tangens complementi arcus minoris, ad tangentem complementi arcus majoris. Et contra.

Ratio

Ratio reciprocationis hujus eadem est, quæ in secantibus. Quia nimirum radius est media proportione inter tangentem arcus & tangentem complementi. Nam Vt ED ad AD, ita AC ad BC, per 4. Sexti Euclidis, sive per 46. primi nostri. Cum igitur sit exempli gratia.



Vt 11269872. tangens 48. grad. 25'. ad radium 10000000, ita radius 10000000. ad tangentem complementi 8873215.

Et,

Vt 5781262. tangens 30. gr. 2'. ad radium 10000000, ita radius ad tangentem complementi 17297260.

Erit etiam:

Vt 11269872. ad 5781262.
ita 17297260. ad 8873215.

Vel viceversa:

Vt 5781262. ad 11269872.
ita 8873215. ad 17297260.

Hinc, si data tangente 11269872, quæratur tangens 5781262. missis illis possum fingere, datam esse tangentem complementi 8873215. & quæri tangentem alterius complementi 17297260. Qua fictione assumpta, proportionem secundi exempli secundi theorematis: quæ talis erat:

Vt radius 10000000. ad sinum arcus AC, ita tangens anguli BAC, ad tangentem arcus BC.

Hanc inquam proportionem inverto & dico: adhibitâ simul varietate theorematis primi.

Vel: ut sinus arcus AC,	—	5129838.
ad radium	— —	10000000.
ita tangens complementi anguli BAC,		8873215.
ad tangentem complementi arcus BC,		17297260.

 Vel

Vel: ut tangens arcus ◡*AC,*	5976055.
ad ſecantem ejuſdem	11649603.
ita tangens complementi anguli BAC,	8873215.
ad tangentem complementi arcus BC,	17297260.

Vel denique: ut radius	10000000.
ad ſecantem complementi arcus ◡*AC,*	19493797
ita tangens complementi anguli BAC,	8873215.
ita tangentem complementi arcus BC,	17297260

Et ita arcum BC, ex iiſdem datis BAC, & ◡AC, novies invenero: ter per primum, ter per ſecundum, & iterum ter per hoc quartum theorema.

DE VARIETATE CALCULI TRIGONOMETRICI IN SPECIE: CIRCA priora tria axiomata planorum.

Priora tria axiomata planorum fortaſſe rectius in unum contrahi: & ſic proponi poſſent.

Latera ſubtenſis angulorum oppoſitorum directè ſunt proportionalia.

Hoc eſt: ut ſe habet latus maximum ad latus minimum: ita ſe habet ſubtenſa anguli maximi ad ſubtenſam anguli minimi. Et ſic de cæteris.

Cauſa eſt: quia cuivis triangulo plano circulus circumſcribi poteſt. Quod ſi fiat, latera trianguli plani jam reipſa ſunt ſubtenſæ angulorum ipſis oppoſitorum: ut libro tertio, axiomate tertio, oſtendimus.

CONSECTARIUM GENERALE.

Datis igitur duorum quorumcunq; angulorum ſubtenſis, cum latere uni datorum angulorum oppoſito; datur etiam latus alteri datorum angulorum oppoſitum. Et contrà.

Datis

Datis duobus quibuſcunque lateribus, cum ſubtenſa anguli uni datorum laterum oppoſiti; datur etiam ſubtenſa anguli alteri datorum laterum oppoſiti: & per ſubtenſam angulus ipſe.

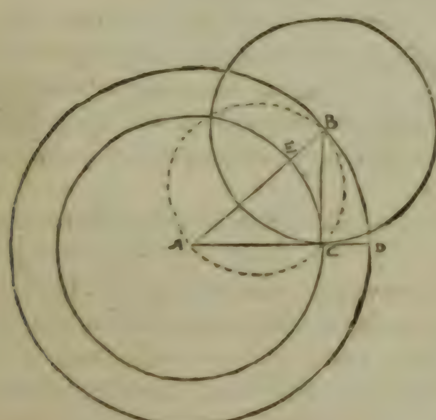
¶ *Dantur autem ſubtenſæ angulorum datorum, in triangulis planis rectangulis tripliciter: nempe*

1. Vel ſic, ut latus ſubtendens rectum ſit radius: latera includentia rectum ſinus.

2. Vel ſic, ut latus majus includentium rectum ſit radius: reliqua duo latera tangens & ſecans acuti minoris.

3. Vel deniq; ſic, ut latus minus includentium rectum ſit radius: reliqua duo latera tangens & ſecans acuti majoris.

Ut in triangulo plano rectangulo ABC, in quo latera AB, BC & AC, ſunt ſubtenſæ angulorum ipſis oppoſitorum: reſpectu circuli punctati ABC.



Si latus AB, ponas pro radio: latera BC & AC, erunt ſinus angulorum BAC & ABC: reſpectu circuli BD.

Si latus

Si latus AC, ponas pro radio, latus BC, erit tangens acuti BAC, latus AB, secans ejusdem: respectu circuli EC.

Si latus BC, ponas pro radio, latus AC, erit tangens acuti ABC, latus AB, secans ejusdem: respectu circuli CD.

¶ *At in triangulis planis obliquangulis: datis angulis dantur subtensæ angulorum uno modo tantum; nempe per sinus tantum. Tangentes enim, & secantes in triangulis planis obliquangulis locum non habent: per eorum definitiones. Sinus autem ubiq; locum habent: quia sunt semisses subtensarum, circulo inscriptarum: quales subtensæ cujusvis trianguli plani latera esse possunt: per antecedentem demonstrationem.*

¶ *Sed & non dati cujusvis anguli subtensa in triangulo plano rectangulo dari potest. Vnumquodq; enim latus trianguli plani rectanguli pro radio, hoc est, partium 10000000, poni, & sic pro subtensa anguli oppositi, etiam nondum noti, haberi potest.*

At in triangulo plano obliquangulo, anguli non dati subtensa nullo modo dari potest. Quia nullum latus trianguli plani obliquanguli pro radio poni potest. Idq; ideo: quia nullum latus trianguli plani obliquanguli diameter circuli triangulo circumscripti esse potest: per 1.c.53.p.1.

Consectaria specialia rectangulorum.

I. *Igitur, in triangulis planis rectangulis:* Dato præter angulos unico latere, datur reliquorum laterum quodlibet, triplici proportione: prout scilicet, vel latus subtendens rectum, vel majus, aut minus includentium rectum pro radio posueris.

II. Da-

II. Datis duobus quibuscunq; lateribus, datur uterq; acutorum, duplici proportione: prout scilicet, vel hoc, vel illud datorum laterum pro radio (*hoc est, pro subtensa anguli oppositi, sive noti, sive ignoti*) posueris.

Consectaria specialia obliquangulorum.

I. *In triangulis planis obliquangulis:* Dato præter angulos unico latere, datur quidem reliquorum laterum quodlibet: Sed unicâ tantum proportione, &c.

II. *Non, simpliciter datis duobus quibuscunq; lateribus:* Sed tantùm, datis duobus lateribus, cum angulo, uni eorum opposito: datur angulus alteri eorum oppositus.

Hæc deductio magis quidem methodica mihi videbatur: Sed illis discipulis meis, qui nihil non apud me poterant, ea ratio, quam libro tertio secutus sum, ad captum tyronum videbatur accommodatior.

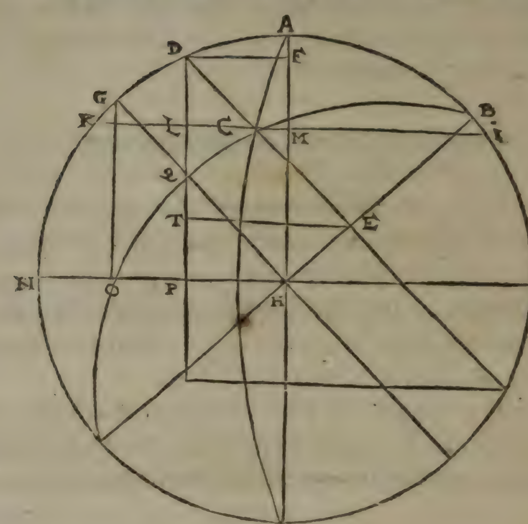
De varietatibus calculi Trigonometrici, iterum in specie:

Circa quartum axioma triangulorum sphæricorum.

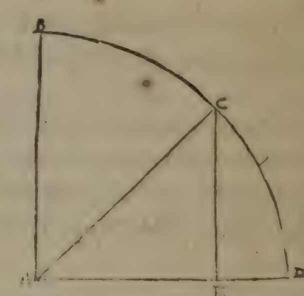
Regiomontanus & eum secuti Finckius atq; Landsbergius quartum axioma triangulorum sphæricorum ita proponunt.

Quadratum radii est ad planum sinuum rectorum, duorum laterum inæqualium: ut sinus versus anguli à dictis duobus lateribus comprehensi, ad differentiam sinuum versorum tertii lateris, & reliquorum duorum laterum differentiæ.

DEMONSTRATIO *eorum breviter hæc est.*



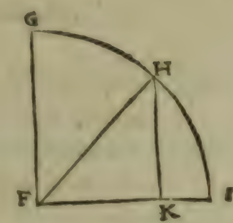
I. Vt GH, radius ad DE, ſinum rectum lateris majoris BC, vel BD, ita GQ, ſinus verſus anguli ABC, in diametro circuli maximi: ad DC, eundem ſinum verſum in diametro circuli paralleli. Quia in circulis inæqualibus: ut radius circuli unius ad radium circuli alterius: ita ſinus tàm recti, quàm verſi, circuli unius, ad ſinus tàm rectos, quàm verſos ſimilium arcuum circuli alterius: *v.g.*



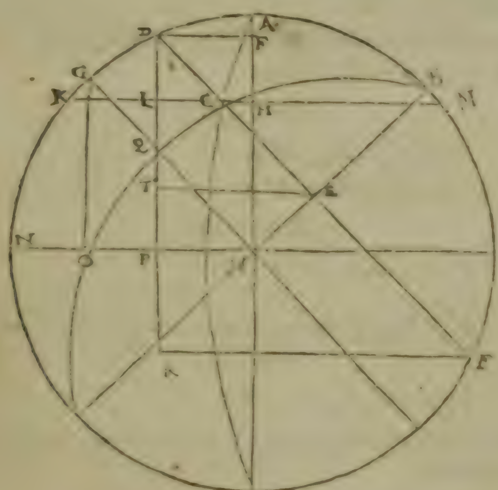
In circulis inæqualibus BCD, & GHI, ſi arcus CD, & HI, ſint ſimiles: eſt ut radius AC, ad radium FH: ita ſinus rectus CE, ad ſinum rectum HK; & ita ſinus rectus AE, ad ſinũ rectũ FK; & ita deniq; ſinus verſus ED, ad ſinũ

verſum

versum KI, per quartam sexti, & per quintam quinti, ac undecimam septimi Euclidis; & per schema ita adjuncta.



II Vt GH, radius ad GO, sinum rectum lateris minoris ◡AB, vel GN, ita DC, ad DL, per quartam Sexti Euclidis. Quo DL, addito ad AF, sinum versum differentiæ laterum AB, & BC, sive BD, nempe arcus AD, efficitur AM, sinus versus tertii lateris AC, vel AK.



Porro: quia est,

Vt GH, ad DE, ita GQ, ad DC. Et
Vt GH, ad GO, ita DC, ad DL.

Est etiam, per multiplicationem proportionum.

Vt planum GH, GH, ad planum DE, GO.

Ita planum GQ, DC, ad planum DC, DL.

Et postremis duobus planis GQ, DC, & DC, DL.

Per commune latus DC, divisis.

Vt planum GH, GH, ad planum DE, GO.

Ita latus GQ, ad latus DL.

Vel, primis etiam duobus planis per communem aliquem divisorem, v. g. per radium, divisis.

Vt GH, radius ad planum DE, GO, radio divisum:

Ita GQ, latus ad DL, latus.

Nam si sit:

Vt 10. ad 8, ita 5. ad 4.

Vt 10. ad 5, ita 4. ad 2.

Erit etiam:

Vt 100, ad 40, ita 20. ad 8.

Et postremis duobus planis per commune latus 4. divisis.

Vt 100. ad 40, ita 5. ad 2.

Vel primis etiam duobus planis per communem aliquem divisorem v. g. per 10, divisis.

Vt 10, ad 4, ita 5. ad 2.

Hæc est demonstratio Regiomontani, Finckii, & Landsbergii: omnino certa, & infallibilis. Quod nemo non videt: nisi qui plane sit ἀγεωμέτρητος.

EXEMPLUM è tertio genere exemplorum nostrorum repetitum.

BC, 59.

	BC 59 58. ſinus rectus.	*8657344.*
	AB, 45. 58. ſinus rectus.	*7189355.*
Diff.	*14. 0.*	*10000000.*
	76.	*9702957.*
	Sinus verſus differentiæ.	*297043.*
	⌣ABC, 28. 14.	*10000000.*
	61. 46.	*8810284.*
	Sinus verſus anguli	*1189716.*

Planum ſinuum rectorum ⌣AB & BC, 6224071937312 0.
Idem planum radio diviſum *6224072.*

Planè conveniens cum medietate rectæ, per proſtaphæreſin à nobis inquiſitæ.

Proportio.

Vt radius	*10000000. DE.*
⌣Ad planum ſinuum rectorum, radio diviſum	*6224072. DT.*
Ita ſinus verſus anguli ⌣ABC	*1189716. DC.*
⌣Ad differentiam	*740488. DL.*
Quam ſi addas ad ſinũ verſum differentiæ laterum	*297043. AF.*
Efficitur ſinus verſus tertii lateris	*1037531. AM.*
Qui demtus de radio	*10000000. AH.*
Relinquit ſinum complementi tertii lateris	*8962469. MH.*

Cui ſinui competit arcus KN. 63 gr. 40'. 8". Cuius complementum 26. gr. 20'. 52". eſt arcus ⌣AK, vel ⌣AC, quæſitus.

JUSTUS BYRGIUS in praxi quarti axiomatis nunquam ſinibus verſis, ſed ſemper ſinibus rectis utitur: Et primum quidem inquirit ſinum complementi tertii lateris, qualis eſſet, angulo ad B, exiſtente recto: deinde differentiam illius ſinus à ſinu anguli obliqui, hoc eſt, rectam CO, vel EO,

 vel LT:

vel LT : inveſtigat: Si angulus ad B, ſit acutus : tali proportione.

Vt DE, radius ad DT, medietatem rectæ,
Ita CE, ſinus complementi anguli ABC, ad CO.

Si angulus ad B, ſit obtuſus: tali proportione.

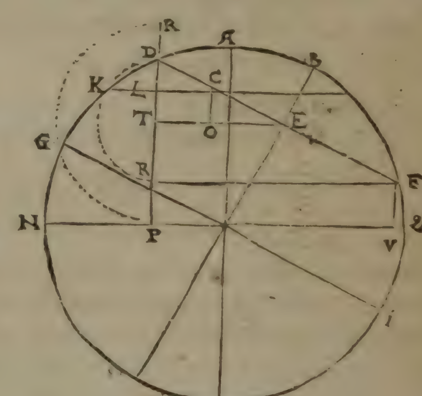
Vt DE, radius ad DT, medietatem rectæ,
Ita EC, ſinus exceſſus anguli ABC, ad EO.

Quam ipſam tamen proportionem ſine omni multiplicatione & diviſione abſoluit: adminiculo primi compendii noſtri.

Porrò, inventum TL, angulo ABC, exiſtente acuto ſemper addit ad TP, ut reſultet LP, ſinus complementi tertii lateris.

At, angulo ABC, exiſtente obtuſo, vel inventum TL, ſubtrahit à TP, ut reſtet LP, ſinus complementi tertii lateris: vel, ab inventa TL, ſubtrahit TP, ut reſtet LP, ſinus exceſſus tertii lateris: quemadmodum faciendum eſſe, adjuncta tria ſchemata docent. Quibus ſingulis ſingula exempla Byrgiano more facta accommodabimus.

EXEMPLUM PRIMUM: QVOD LIbro quarto fuit ſecundum ſecundi generis.



Latus

Latus minus GN, vel QI, 26. gr. 20'.
Compl. lateris majoris GD, vel FI, 30. 2. } *adde & subtrahe.*

Summa DN. 56. 22. Sinus. 8325991. DP.
Differẽtia FQ, 3. 42. Sinus 645323. PR.

Summa 8971314. rP.

Dimidium 4485657. TP, inventum I.
645323. Dr.

ABC, quasi la 22. gr. 35'. 1½". 3840334. DT, medietas recta.
tus minus 50. 4. 6.

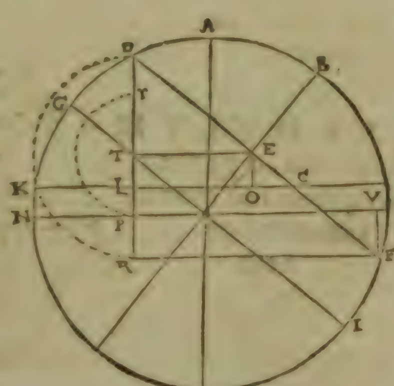
Summa. 72. 39'. 1½. Sinus 9545031.

Differentia. 27. 28. 58½. Sinus 4614841.
Differentia 4930190.

Dimid. 2465095. CO, vel LT, inventum II.
4485657. TP, inventum I.

Summa. 6950752. LP, sinus complementi tertii lateris.

EXEMPLVM SECVNDVM: QVOD libro quarto fuit tertium tertii generis.



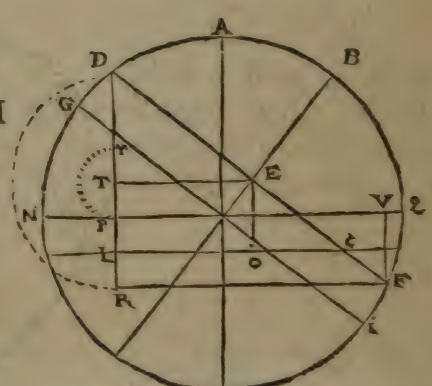
Latus

Latus minus GN, vel QI, 45. gr. 58'.
Compl. majoris GD, vel FL. 30. 2.

Summa DN, 76. 0. Sinus 9702957. DP.
Differentia FQ, 15. 56. Sinus 2745187. PR.
Diff. 6957770. RP.
Dimid. 3478885. TP. inventum. I.
2745187. PR, vel Dr.
38. gr. 29'. 31''. 6224072. DT, medietas rectæ

Latus minus 51. 30.29.
Exc. ◡ABC. 22. 35. 0.
Summa 74. 5.29. Sinus, 9617001.
Differentia 28. 55.29. Sinus. 4836600.
Differentia. 4780401.
Dimid. 2390200. EO, vel LT, inventum, II.
3478885. TP, inventum. I.
Differentia. 1088685. LP, sinus complementi tertii lateris.

EXEMPLVM TERTIUM, QVOD libro quarto fuit quartum tertii generis.



Latus

Latus minus GN, vel QI, 45. gr. 58'.
Compl. majoris GD, vel FI. 30. 2.
Summa DN, 76. 0. Sinus 9702957. DP.
Differentia QF, 15. 56. Sinus 2745187. PR.
Diff. 6957770. rP.
Dimid. 3478885. TP. inventum. I.
2745187, PR.
38. gr. 29'. 31''. 6224072. DT. medietas rectæ.
ABC. q. latus minus. 10. 0. 0.
48. 29'. 31. Sinus 7488625.
28. 29. 31. Sinus 4770352.
Summa 12258977. (tum. II.
Dimid. 6129488. EO, vel TL. invē-
3478885. TP, inventum I.
Differentia. 2650603. PL, sinus excessus
tertii lateris.

Hic est modus Byrgii. Alios aliorum modos referre, non est operæ precium.

APPENDIX LIBRI QUINTI,

Continens explicationem & demonstrationem Regulæ falsi.

Quia Regula falsi in Trigonometria tam magnum usum habet, ut discipulum ejus artis à tricis Algebraicis prorsus liberare possit: quemadmodum libro secundo ostendi: visum est Regulæ illius & præceptum & demonstrationem hoc loco breviter explicare.

Præceptum Regulæ falsi tale est.

Loco numeri quæsiti pone numerum pro libitu magnum aut parvum; & per eum operare secundum præscriptum

 quæstionis

quæstionis propositæ. Tum, si exit quod exire debebat; habes numerum quæsitum: sin autem; differentiam inter id quod exit, & quod exire debebat, sive falsitatem, nota per Plus vel Minus; & per aliam positionem, sive majorem sive minorem, eandem operationem repete. Deinde multiplica per crucem sive alternatim, positionem primam per falsitatem secundam, & positionem secundam per falsitatem primam: tumque, si falsitates fuerint homogeneæ, subtrahe duo producta à se invicem, & duas etiam falsitates à se invicem: sin falsitates fuerint heterogeneæ, adde tùm productum producto, tùm falsitatem falsitati: ac deniq; productorum vel residuum vel aggregatum divide per falsitatum vel residuum vel aggregatum, & habebis numerum quæsitum.

Casus igitur regulæ falsi tres sunt:

Primus casus est; ubi utraq; falsitas est Plus: secundus casus; ubi utraq; falsitas est Minus: tertius casus; ubi altera falsitas est Plus, altera Minus.

Exempli gratia, quæratur numerus, cui si addatur pars tertia, & ab aggregato auferatur pars sexta, relinquantur 100.

Is numerus revera est 90. ut patet ex calculo subiecto

90
$\frac{1}{2}$) 30 *Adde*
120
$\frac{1}{6}$) 20 *Subtrahe.*
100 *residuum.*

At fingam me numerum illum nescire: & pro primo casu primò ponam, numerũ illum esse 144. deinde ponam esse, 08. Operatio talis erit.

Positio prima.	144	*Positio secunda.*	108
	$\frac{1}{3}$)48	*Adde*	36
	192		144
	$\frac{1}{6}$);2	*Subtrahe*	24
	160	*Exit*	120
	100	*At exire debebat*	100

Falsitas

Falsitas prima.	60		*Falsitas secunda.*	20
Positio secunda	108		*Positio prima.*	144
	6480	*Productum.*		2880
	2880	*Subtrahe.*		
Residuum	3600	*Dividendum.*	*Falsitas prima* +	60
	40	*Divisor.*	*Falsitas secunda* +	20
			Residuum.	40

(90 *Quotus:*
hic est numerus
quæsitus.

Pro secundo casu, primo ponam numerum illum, quem quæro, esse 54. deinde ponam esse 72. Operatio talis erit.

Positio prima.	54	*Positio secunda.*	72
	$\frac{1}{3}$ | 18		24
	72		96
	$\frac{1}{6}$ | 12		16
	60		80
	100		100
Falsitas prima.	40	*Falsitas secunda*	20
Positio secunda.	72	*Positio prima.*	54
	2880		1080
	1080	*Falsitas I.* — —	40
	1800 *Dividẽdus.*	II. — —	20
	20 *Divisor.*	*Divisor*	20
	(90. *Quotus.*		

Pro tertio casu primo ponam numerum quæsitum esse 54. deinde ponam esse. 144. Operatio talis est.

Positio prima.	54	*Positio secunda.*	144
	$\frac{1}{3}$ | 18		48
	72		192
	$\frac{1}{6}$ | 12		32
	60		160
	100		100

Falsitas prima.	40	*Falsitas secunda.*	60
Positio secunda.	144	*Positio prima.*	54
	5760		3240
	3240		
	9000 *Dividendus.*	*Plus.*	60
	100 *Divisor.*	*Minus.*	40
	(90. *Quotus.*		100 *Divisor*

Intelligis opinor mentem Regulæ falsi: jam demonstrationem cape. Cujus fundamentum hoc est: quod

Falsitates positionum & acquisitorum sunt inter sese proportionales. *hoc est: sicut se habet falsitas positionis primæ ad falsitatem positionis secundæ: ita se habet falsitas acquisiti primi, ad falsitatem acquisiti secundi.*

Voco autem falsitates positionum, excessum vel defectum numerorum positorum, suprà vel infra numerum verum.

Verbi gratiâ. In primo casu erant:

Positio prima.	144.	*Positio secunda.*	108
Numerus verus.	90.		90
Differentia.	54.		18

Ergò falsitas positionis primæ fuit 54. secundæ. 18.

Falsitates acquisitorum voco excessum vel defectum numerorum per processum quæstionis propositæ acquisitorum suprà vel infrà numerum quæsitum. Verbi gratiâ in primo casu erant:

Acquisitum primum.	160.	*Acquisitum secundum.*	120
Numerus quæsitus.	100.		100
Differentia.	60.		20

Ergò falsitas acquisiti primi fuit 60. secundi 20. Dico jam, esse,

Vt 54. ad 18. ita 60. ad 20.

Causa est: quia eâdem ratione utrobiq; processum fuit: nempe, addendâ primum ad numerum positum unâ tertiâ, deinde ab aggregato subtrahendâ unâ sextâ.

Effectus causæ respondet: ut vides ex calculo subjecto.

Vt 54.

Vt 54. ad 18. ita 60. ad 20.

Multiplica. 18
per. 60

Divide. 1080 (eradit 20.
54
108

000
54.

Quia igitur est: ut falsitas positionis primæ ad falsitatem positionis secundæ; ita falsitas acquisiti primi ad falsitatem acquisiti secundi: ideò, si falsitates illæ per crucem multiplicentur, nempe, falsitas positionis primæ per falsitatē acquisiti secundi, & falsitas positionis secundæ per falsitatem acquisiti primi: producta duarum illarum multiplicationum erunt æqualia. Nam si quatuor numeri sint proportionales, productum mediorum æquatur producto extremorum: ut de lineis demonstratum fuit lib. 1. prop. 42: in numeris autem eadem est ratio. Cum igitur sint,

Vt 54. ad 18. ita 60. ad 20.

Productum numeri 18. per 60. idem erit cum

Producto numeri 54. per 20. Quod ipsum etiam calculus subiectus verum esse comprobabit: qui calculus ita habet.

Falsitas positionis primæ.	54	*Falsitas positionis secundæ.*	18
Falsitas acquisiti secundi.	20	*Falsitas acquisiti primi.*	60
	1080		1080

Porrò, in multiplicatione perinde est, sive numerum totum per totū; sive totum unum per partes alterius multiplicem. Verbi gratiâ; perinde est, sive multiplicem 7. per 7. sive 7. per 4. & 3. Per utramq; enim multiplicationē invenero 49. ut & ratio dictat, & calculus subjectus ostendit.

7	7	7
7	4	3
49	28	21

Adde 21
Fit 49

Ergò in proposito exemplo primi casus, si primam positionem 144.

 multipli-

multiplicem per secundi acquisiti falsitatem, nempe per 20. perinde est, ac si multiplicaverim 90. & 54. per 20. Et per consequens, productum multiplicationis numeri 144. per 20. continet numerum verum 90. vicies, & falsum 54. itidem vicies.

Similiter, si secundam positionem 108. multiplicem per falsitatem acquisiti primi, nempe per 60.

Perinde est, ac si multiplicaverim 90. & 18. per 60. Et per consequens, productum multiplicationis numeri 108. per 60. continet numerum verum 90. sexagies, & falsum 18. etiam sexagies.

Atqui 18. sexagies, & 54. vicies, æquipollent: ut jam antè demonstratum fuit.

Ergò si productum numeri 144. per 20. subtraxero de producto numeri 108. per 60. falsum numerum, qui primo producto adhærebat, totaliter subtraxero; & insuper verum numerum vicies subtraxero. Restabit igitur verus numerus quadragies: quantum scilicet restabit de falsitate 60. post subtractam falsitatem 20.

Ergò si quod restat, post subtractionem unius producti ab altero, per id quod restat post subtractionem unius falsitatis acquisitæ ab altera, divisero; necessariò verus numerus exibit.

Prorsus ad eundem modum in secundo casu: si positionem primam 54. multiplicem per falsitatem secundam 20. perinde est, ac si multiplicaverim 20 pe 90. minus 36.

Ergò productum 54. per 20. continet verum numerum 90. vicies, minus falso numero 36. vicies.

Similiterq; si positionem secundam 72. multiplicem per falsitatem acquisiti primi, nempe per 40. perinde est, ac si multiplicaverim 90. minus 18. per 40.

Ergò productum 72. per 40. continet verum numerum 90. quadragies, minus falso numero 18. itidem quadragies.

Iam quadragies 18. & vicies 36. æquipollent, per antecedentem demonstrationem.

Ergò, si de producto 72. per 40. subtraxero productum 54. per 20. Falsita-

Falſitatem primo producto adhærentem totaliter ſubtraxero, & inſuper verum numerum vicies ſubtraxero: ac proinde verus numerus reſtabit vicies: ſicut ſubtractis falſitatibus 20. de 40. reſtant 20.

Ergò ſi reſiduum productorum diviſero per reſiduum falſitatum acquiſitarum, Quotus erit numerus verus quæſitus.

In tertio caſu: ſi poſitionem primam 54. multiplicem per falſitatem acquiſiti ſecundi, nempe per 60. Perinde erit ac ſi multiplicavero 90. minus 36. per 60. Productum igitur continebit verum numerum 90. ſexagies, minus falſo numero 36. ſexagies.

Si poſitionem ſecundam 144. multiplicem per 40. perinde eſt ac ſi multiplicaverim 90. & 54 per 40. Productum igitur continebit verum numerum 90. quadragies: & falſum 54, etiam quadragies.

Atqui ſexagies 36. & quadragies 54. æquipollent, per ſuperiorem demonſtrationem: atq. adeo, quantum uno loco deeſt, tantum altero loco ſupereſt: & per conſequens, ſi productum 54 per 60. addidero ad productum 144. per 40: aggregatum nullam amplius falſitatem habebit, ſed verum numerum 90. continebit ſexagies & quadragies. hoc eſt centies.

Ergo ſi ſummam productorum per ſummam falſitatum acquiſitarum diviſero, verum numerum habebo.

FINIS.

Errata Trigonometriæ.

Pag. 10. lin. 20. pro GH lege CH. & in schemate inter A & K pone G.
pag. 23. lin. 3. & 4. lege. prop. 32. 33. 35. 36. 37. & 38.
pag. 24. lin. 2. & 13. pro 7. lege o.
pag. 28. lin. 10. pro non, lege, uno.
pag. 40. lin. 12. pro K. lege B. lin. 18. pro 36. lege 38.
pag. 41. lin. 18. lege, subtensa simpli, dupli, tripli &c.
pag. 45. lin. 1. pro 6q. lege bq. lin. 8. pro. cyphra. 1. lege cyphra ad 1. lin. 15. pro v & i lege √ et ʒ.
pag. 72. lin. 8. pro B. lege N. lin. 9. & 19. pro 7. lege 12.
pag. 73. lin. 21. addantur hæc verba: Quæratur autem sinus 70. graduum.
pag. 78. lin. 13. pro recta, lege recte.
pag. 80. lin. 2. 3. 5. 14. pro. 8. gr. 9. lege 89. gr. similiterq́ linea 7. & 8. pro 2. gr. 1. lege 21. gr. item pro 6. gr. 8. lege 68. gr. sic pag. 122. lin. 11. 14. 16. 19. pro 2. gr. 6 lege 26. gr. pro 2. gr. 8. lege 28. gr. pro 4. gr. 5. lege 45. gr. pro 5. gr. 0. lege 50. gr. pro 5. gr. 9. lege 59. gr.
pag. 81. lin. 6. pro 41. lege 43.
pag. 82, lineâ 1. & deinceps in tangentibus d.le puncta, & numeros sub se mutuo colloca, ut paulo post, nempe linea 23. &c. collocati sunt.
pag. 85. lin. 20. pro 52. lege 25.
pag. 93. lin. ult. pro 49. lege 48.
pag. 99. lin. 19. & 20. pro B. lege C. lin. 24. pro ⌣ABC. lege ⌣ACB.
pag. 100. lin. 9. pro 7. lege 12. lin. 12. 14. 15. 16. 17. pro ⌣AC. semper lege AB. & lin. 12. pro ABC. lege ACB.
pag. 113. lin. 4. pro 7. lege 12. sic pag. 114. lin. 12.
pag. 117. lin. 1. pro 8. lege 17. lin. 27. pro FF. lege EF.
pag. 118. lin. ult. pro quadra, lege quadrantes.
Item pag. 120. lin. 15. & 23. pro 7. lege 12.
pag. 124. lin. 29. pro 7. lege 12. lin. 30. pro 8. lege 13.
pag. 156. lin. 22. lege, si 5, per 5.
pag. 172. lin. 14. adde, Et,

Errata,

Errata problematum.

Pag.5.lin.6.pro ABST, lege ADST.

pag.6.lin.1.pro F lege E.

pag.11.lin.8.pro CH. lege AF.lin.15. lege: Quod multiplicatum.

Pag.16.lin.17.pro si, lege sit.

pag.41.lin.15.pro &, lege est.

pag.59.pro dc. lege dC. & ante dC. pone cC.

pag.76.lin.7.pro EK. lege EQ.

pag.110.lin.17.& 18.pro 155. lege 115. lin.19.& 20. pro æquales, lege æquantur.

pag.111. lin.11.pro. (4. lege (40. & lineam 14. duobus locis promove.

pag.135.lin.8.& 28.pro 2. lege 3.

BARTHOLOMÆI PITISCI GRVNBERGENSIS

PROBLEMATVM VARIORVM:

NEMPE

Geodæticorum,
Altimetricorum,
Architectonicorum,
Geographicorum,
Gnomonicorum, &
Aſtronomicorum.

LIBRI VNDECIM,

TRIGONOMETRIÆ SVBjuncti, ad uſum eius demonſtrandum.

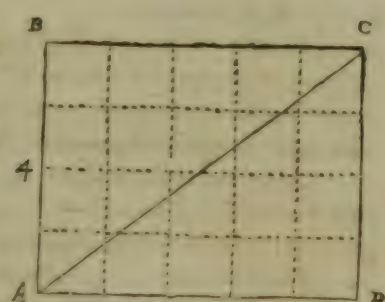
FRANCOFVRTI,
Apud Nicolaum Hoffmannum, ſumptibus
IONÆ ROSÆ, Anno 1612.

BARTHOLOMÆI PITISCI
Grunbergensis

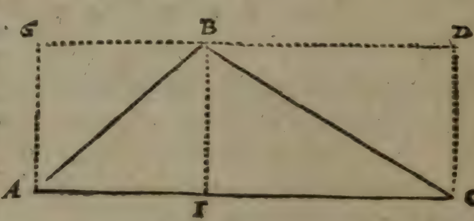
PROBLEMATUM
GEODÆTICORVM
Liber Unus.

PRÆFATIO.

Socrates hunc principalem Geometriæ (cujus pars est Trigonometria) finem esse statuebat: ut agrum planum metiri dividereq; possis. Tanti Philosophi judicium secuti, istius generis problematibus merito primum locum attribuimus. Cæterum, cum variæ sint rationes agri plani dimetiendi, mihi ea semper visa est expeditissima, quæ fit, vel per quadrangula, vel per triangula rectangula. Nam si duo latera includentia rectum, inter se multiplices, productum multiplicationis totum, erit area quadranguli; dimidium, trianguli; à talibus lateribus constituti. Vt si duo latera includẽtia rectũ ABC, nẽpe AB, quatuor decempedarũ,



& BC,5.inter se multiplices, productum multiplicationis totum, nempe 20.erit area quadranguli ABCD. Productum verò multiplicationis dimidium nempe 10.erit area Trianguli ABC, ut vel ex adjuncto diagrammate liquet. Ad hujusmodi igitur Triangula plana rectangula quomodo ager quilibet, qui formam exactè quadrangulam rectangulam non habeat, sine errore reduci possit, duobus problematibus ostendemus. Vbi tamen notandum est, factâ reductione non opus esse ut utrumque triangulum rectangulum seorsim supputetur: sed satis esse, si sola basis trianguli obliquanguli per perpendiculum multiplicetur. Ista enim unica multiplicatio exhibet utriusque trianguli rectanguli, hoc est, totius obliquanguli aream duplam. Exempli gratia, In triangulo obliquangulo ABC. factâ reductione ad duo triangula rectangula ABF & FBC.non opus est, ut seorsim aream trianguli rectanguli ABF, & iterum seorsim aream trianguli rectanguli CBF inquiras, latera AF & BF, item BF & FC invicem



multiplicando: sed satis est, si basin trianguli obliquanguli ABC.nempe rectam AC.per perpendiculum BF vel DC.multiplices. Nam eo facto statim habebis aream quadranguli rectanguli AGDC. cujus dimidiam esse aream trianguli obliquanguli ABC. vel ipsa figuræ inspectio te docebit. Sed & hoc notandum est, sæpe quadrangula & triangula rectangula in unam figuram conjungi, sic ut inde fiat trapezium, vel simplex, quale est ABCD. vel duplex, qualia sunt FGHI, & MNOP. In quibus casibus omnibus, si longitudinem mediam: qualis est in prima figurâ recta AS, in secunda VW, in tertia XY; per latitudinem multiplices, aream habebis. v.g. In trapezio ABCD.

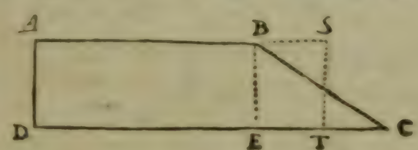
Longitu-

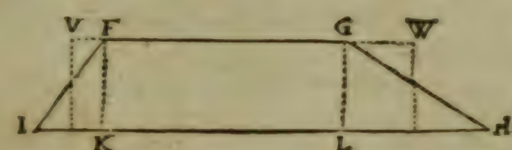
Longitudo minima AB sit — 10. ped.
maxima DC. — — 16. ped.

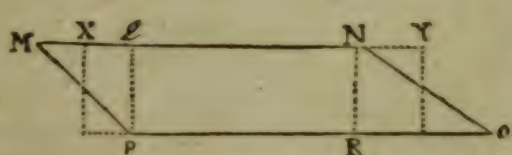
26. ped.

media AS — — 13. ped.
Latitudo AD vel ST — — 4. ped.

Area igitur ABST, vel ABCD. erit 52. ped. Atq; hæc qui-



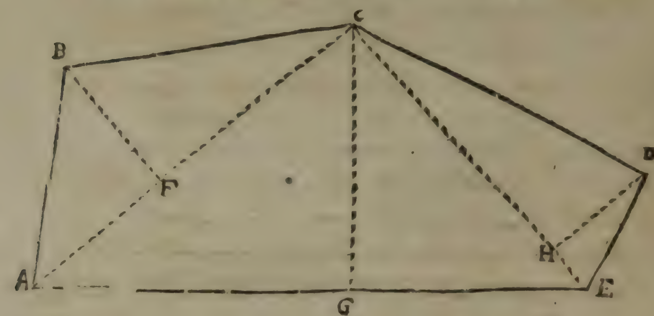




dem obiter in gratiam tyronum annotata sunto. Nunc ad ipsa illa, quæ propriè instituti nostri sunt, problemata accedemus.

PROBLEMA PRIMVM.

Agrum planum multangulum, cujus data sint latera unà cum diagonis: sed anguli non item: in Triangula rectangula dispertire.



Sit propositus ager planus multangulus ABCDF. Et sint data ejus latera omnia: unà cum diagoniis AC, & CE. quærantur autem perpendicula BF, CG & DH, unà cum segmentis diagoniorum AF & FC. Item AG & GE, & denique CH & HE. Et sint, AB, 7. pedum, BC 9. CD, 10. DE, 4. EA, 17. AC, 13. DE, 11.

Dico pro solutione Trianguli obliquanguli ABC.

I. Vt latus maximum AC, — — —	13	AB 7.
ad summam laterum AB, & BC, — —	16	BC. 9.
Ita differentia laterum AB & BC, — —	2	Summa. 16.
ad segmentum — — — —	$2\frac{6}{13}$	Differentia 2
Quo demto de AC. — — — —	13	
Relinquitur — — — — —	$10\frac{7}{13}$	
Cuius dimidium est AF — — — —	$5\frac{7}{26}$	
Quo subtracto de AC — — —	13	
Relinquitur FC — — — —	$7\frac{19}{26}$ per 4. pl.	

		26	26
II. Vt AB latus, pedum — —	7	5	7
		130	182
ad AF latus, pedum — — —	$5\frac{7}{26}$	7	
		13700000(7.&c.	
Ita AB. radius — —	100000	182	

Ad AF

Ad AF. ſinum anguli ABF — 75274—48 gr. 50′. per 1. pl.
Cuius anguli complementum eſt BAF. 41. 10.

III. Vt AB radius — — — — — 100000
ad BF. ſinum anguli BAF. 41. gr. 10′ — 65825
Ita hypotenuſa AB — — — — — 7. pedū
ad perpendiculum BF — — — 4|60775. per. 1. pl.
Quod multiplicatum per baſin AC. — 13|

Exhibet aream trianguli ABC. duplam 59|90075
ſimplam 29|95037
ſive — $29\frac{95}{100}$ pedum quadratorum.

¶ *Similiter pro ſolutione Trianguli obliquanguli ACE, dico:*

I. Vt latus maximum AE — — — 17
ad ſummam laterum AC & CE — — 24
ita differentia laterum AC & CE — — 2
ad ſegmentum — — — $2\frac{14}{17}$
Quo demto de AE — — — 17
Relinquitur — — — — $14\frac{3}{17}$
Cuius dimidium eſt GE — — $7\frac{3}{34}$
Quo ſubtracto de AE — — 17
Relinquitur AG — — — $9\frac{31}{34}$. per 4. planorū.

AC. 13
CE. 11
Summa 24
Differentia 2.

II. Vt CE. latus — — 11
ad GE latus — — $7\frac{3}{34}$
Ita CE radius — — 100000
ad GE ſinum anguli GCE. — 64439—40 gr. 7. per 1. pl.
Cuius complementum eſt CEG. — — 49. 53.

Per primum planorum.

III. Vt EC radius — — — 100000
ad CG. ſinum anguli CEG — 67473

Ita

Ita EC. hypotenusa — — — — 11
ad CG. perpendiculum — — — 8|41203.per 1.pl.
Quod multiplicatum per basin AE — 17
Exhibet aream trianguli ACE.duplam 143|00451
simplam 71|50225

¶ *Deniq. pro solutione Trianguli obliquanguli CDE, dico:*

I. Vt maximum latus CE — — 11 | CD. 10
ad summã laterum CD & DE — 14 | DE. 4
Ita differentia laterum CD & DE 6 | Summa. 14
ad segmentum — — — — $7\frac{7}{11}$ | Differentia 6
Quo subtracto de CE — — 11
Relinquitur — — — — $3\frac{4}{11}$
Cuius dimidium est HE — — $1\frac{15}{22}$
Quo subtracto de CE — — 11
Relinquitur CH — — — $9\frac{7}{22}$ per 4.pl.

II. Vt ED latus — — — — — 4
ad HE. latus — — — — — $1\frac{15}{22}$
ita ED. radius — — — — 100000
ad HE. sinum anguli HDE — — 42046 — 24 gr. 51′
Cuius complementum est angulus HED —— 65 8
Per primum planorum.

III. Vt DE. radius — — — — — — 100000
ad HD. sinum anguli HED — — — 90729
Ita DE hypotenusa — — — — 4 pedum
ad HD. perpendiculum — — — 3|62916 per 1. pl.
Quod multiplicatum per basin EC — 11
Exhibet aream trianguli ECD duplam 39|92076

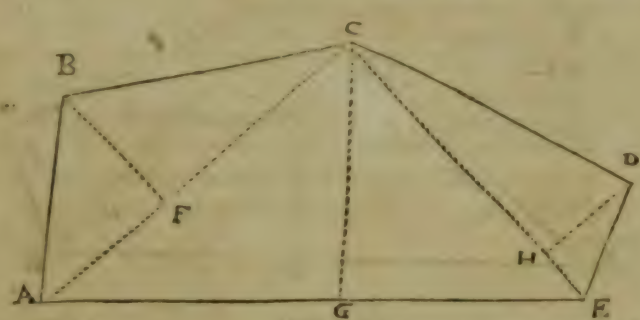
simplam

simplam	19|96038	
Cui adde aream trianguli ABC ——	29|95037	
Item aream trianguli ACE —— ——	71|50225	
Et habebis aream totius agri ABCDE.	$121\frac{417}{1000}$	pedû quadratorum.

PROBLEMA SECVNDVM.

Agrum planum multangulum, cujus data sint latera & anguli exteriores, diagonii non item: in Triangula rectangula dispertire.

Sæpe fit, ut ager planus rectis itineribus pertransiri non possit: propter arbores aut paludes interjectas:



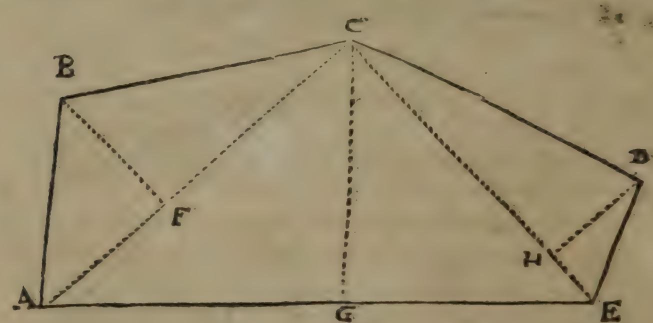
In eo casu lineæ angulares, sive diagonii, & inde deniq; perpendicula, ac bases Triangulorum rectangulorum reperiuntur hoc modo. Sit exempli gratia ager planus multangulus ABCDE: qui pridem: Et sint in eo data latera AB, *7*. ped. BC, 9. CD, 10. DE, 4. EA, 17. unà cum angulis ABC, *108*. gr. *2'*. BCD 141. gr. 53'. CDE, 93. gr. *35*. DEA, 115. gr. *1'*. EAB, *81*. gr. *29'*. Quærantur autem perpendicula & bases Triangulorum rectangulorum in eo agro contentorum.

Pro solutione Trianguli obliquanguli ABC.

Primùm colligo & summam, & differentiam laterum AB & BC. Itemq; summam & dimidium summæ angulorum ad A & C hoc modo.

BC, 9.	ABC, 108. gr. 2'.
AB, 7.	Compl. 71. 58'.
Summa 16.	Dimid. 35. 59.
Differentia 2.	

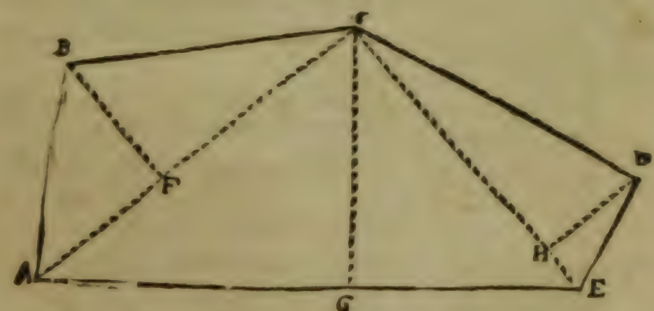
Deinde dico:



I.	Vt summa laterum AB & BC	16
	ad differentiam eorundem	2
	Ita tangens 35. gr. 59'.	72610
	ad tangentem	9076
	Cuius tangentis arcus vel angulus est	5. gr. 11'.
	Quo addito ad	35. 59.
	Efficitur angulus BAC vel BAF	41. 10.
	Cuius complementum est angulus ABF	48. 50.
	Subtracto vero eodem angulo	5. 11.
	de angulo	35. 59.
	Relinquitur angulus BCA vel BCF	30. 48.
	Cuius complementum est angulus CBF	59. 12. per 3. pl.

II. Ut

II. Vt AB. radius		100000
ad BF. ſinum anguli BAF. 41.gr.10′.		65825
Ita AB. pedum	7	
ad BF. pedum	4	60775.per.1.pl.
III. Vt AB. radius		100000
ad AF ſinum anguli ABF. 48.gr.50′.		75280
Ita AB. pedum	7	
ad CH. pedum	5	26960.per 1.pl.
IV. Vt BC. radius		100000
ad FC ſinum anguli FBC. 59 gr.12.		85896
Ita BC. pedum	9	
ad FC. pedum	7	73064 (per 1.pl.)
Quo addito ad AF.	5	26960
Fit AC.	13	00024
Quo multiplicato per BF.	4	60775
Exhibet aream trianguli ABC. duplam.	59	90
Ergo area trianguli ABC. ſimpla eſt	29	$\frac{95}{100}$ pedum quadratorum.



 Deinde

Deinde pro solutione Trianguli obliquanguli ACE.

Primùm, de angulo EAB —	81.gr.29′.
subtraho angulum BAC —	41.gr.10.
Et relinquitur angulus CAG —	40.gr.19.

Deinde pro latere AC. nuper invento 13|00024. assumo 13. fractione scilicet $\frac{24}{100000}$ neglecta: quippe quæ fermè nullius sit momenti.

Denique dico per. 1. pl.

Vt AC. radius — — —	100000
ad GC. sinum anguli GAC. 40 gr. 19. — —	64708
Ita AC pedum — — —	13
ad GC. pedum — — —	8|41113
Quod multiplicatum per AE — —	17|
Exhibet aream ACE duplam —	142|98921
simplam —	71|49460

Postremo, ad solutionem Trianguli CDE accedens:

Primùm colligo summam & differentiam duorum laterum CD & DE. Item summam & dimidium summæ duorum angulorum ad C & E. hoc modo:

Latus CD. 10.	Angulus CDE	93.gr.35.
Latus DE. 4.	Complementum ad 2 rectos	86. 25.
Summa. 14.	Dimidium	43. 12.
Differentia. 6.		

Deinde dico per 3. pl.

I. Vt summa laterum CD & DE	14
ad differentiam eorundem	6
Ita tangens anguli 43. 12.	93906

ad tan-

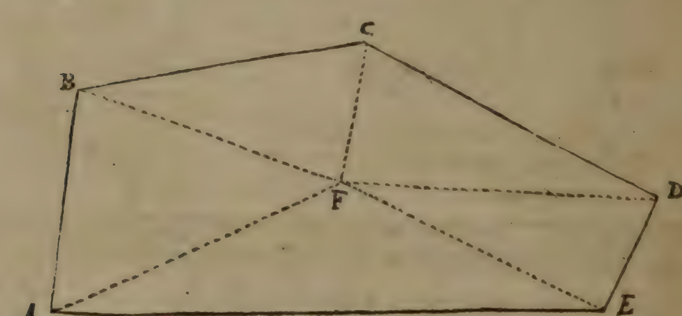
ad tangentem		40245
Cui in Canone respondet angulus		21.gr.55'.
Quo addito ad angulum		43 gr.12.
Efficitur angulus CED		65.gr. 7
Cuius complementum est angulus HDE		24.gr.53.
Quo subtracto de angulo CDE		93.gr.35
Relinquitur angulus HDC		68 gr.42
Cuius complementum est angulus HCD		21 gr.18
II. Vt CD. radius		100000
ad HD. sinum anguli HCD. 21.gr.18'.		36325
Ita CD. pedum	10	
ad HD. pedum	3	63250.per.1.pl.
III. Vt CD. radius		100000
ad CH sinum anguli CDH. 68.gr.42.		93169
Ita CD. pedum	10	
ad CH. pedum	9	31690.per 1.pl:
IV. Vt DE. radius		100000
ad HE sinum anguli HDE. 24 gr.53.		42077
Ita DE. pedum	4	
ad HE. pedum	1	68308 (per 1.pl.)
Quo addito ad CH.	9	31690.
Fit CE.	10	99998
Hoc est, ferè	11	
Quo multiplicato per DH.	3	6325
Fit	39	9575
Cuius dimidium est area CDE	19	9787
Cui adde aream ACE	71	4946
Item aream ABC.	29	95

Et habebis aream totius agri, ut ante. 121 $\frac{4271}{10000}$. pedum quadratorum.

Cæterùm, ut hoc obiter adiiciam, anguli agri plani, quos in hoc problemate dandos esse diximus, observantur vel per Quadrantem, vel per Instrumentum orbiculare, duplici dioptra instructum, & in 360. partes divisum. In qua observatione, an à vero aberraveris nec ne, sic deprehendes:

Omnes angulos circa agrum observatos collige in unam summam. Quæ summa, si duplo plures rectos effecerit quàm sunt latera, minus quatuor rectis, justa est observatio: sin autem; erronea.

Nam unaquæque figura multangula, meris angulis internis constans, habet ad circumferentiam duplo plures rectos quàm latera, minus quatuor rectis. Quia, si ex singulis angulis rectæ ad centrum figuræ ducantur, tot fiunt in figurâ triangula, quot sunt latera. Atqui singula illa triangula habent duos rectos, per 49. p. 1. Ergo universa habent duplo plures rectos quàm sunt latera figuram includentia. Iam quatuor recti triangulorum istorum ad centrum figuræ consistunt, per 6. & 15. p. 1. Ergo reliqui recti ad circumferentiam consistunt. Exempli loco sit ager quinquangulus,



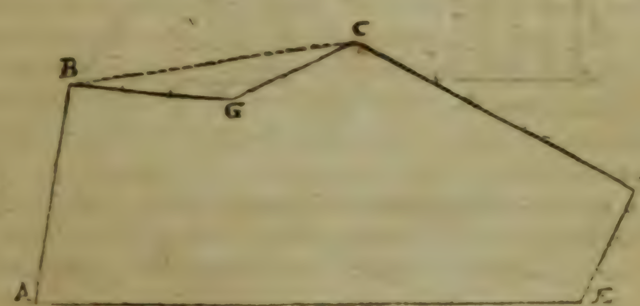
hactenus

hactenus à nobis dimensus. Is habet quinque latera. Ergo debet habere sex angulos rectos. Nam bis quinque sunt decem. Decem, minus quatuor, sunt sex. An igitur hoc ita sit, hoc est, an ager ille ex nostra obseruatione habeat sex angulos rectos, videre juvat.

Fuerunt autem anguli observati,	ABC.	108 gr.	2'.
	BCD.	141.	53.
	CDE.	93.	35.
	DEA.	115.	1.
	EAB.	81.	29.
	Summa est —	540. gr.	0

quæ summa quærebatur. Nam sex recti efficiunt 540. gradus, Sexies enim 90. sunt 540. Iusta igitur fuit observatio.

Quod si latera aliqua versus centrum sint inflexa, & angulum faciant externum, ut in hac alterâ figurâ latera BG & CG versus centrum sunt inflexa, & angulum faciunt ex-



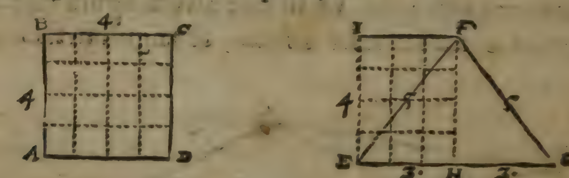
ternum BGC. Pro lateribus illis duobus BG & GC, revera in agro existentibus, sume & numera unicum latus imaginariũ BC. & de tot rectis quot habitura esset figura ABCDE subtrahe anguli BGC complementũ ad duos rectos, hoc est, subtrahe

trahe

trahe summam angulorum GBC & BCG. de rectis in figura ABCDE existentibus: residuum erit summa angulorum in figura data contentorum. Exempli gratia: si angulus BGC sit 150. graduum, summa angulorum GBC & BCG erit 30. graduum. De sex igitur rectis qui competunt figuræ quinquangulæ ABCDE, hoc est, de 540 gradibus, si subtraxeris. 30. gradus, restabit summa angulorum in figurâ ABGCDE contentorum 510. gr. Causam vel me tacente intelliges, si oculis non limis figuram propositam inspexeris.

APPENDIX.

Antequam hunc librum concludam: paucis te moneo, lector, quisquis es: si geodæsiam exercere velis, ut etiam atque etiam tibi caveas à vulgari illo errore circumforaneorum geodætarum: qui quos agros iisdem passibus obambulaverint, eos æquales esse censent. Quæ censura, quàm sit iniqua, vel ex hoc exemplo disces:



Sint duo agri ABCD, & EFG, utrique habentes in circuitu decempedas sedecim. Et si ager ABCD, quadratus. EFG, triangularis. Dico aream agri EFG, multò esse minorem, quam sit area agri ABCD. Nam area quidem agri ABCD, si latera AB & AD, in sese mutuò ducas, invenietur esse sexdecim decempedarum. At area agri EFG, si perpendiculum FH 4, ducas in basin alterutram EH, vel HG, 3. non nisi duodecim decempedarum esse deprehendetur. Magna igitur iniuria afficietur, si quis eodem precio agrum EFG, quo agrum ABCD, vel emerit, vel conduxerit. Quatuor enim decempedis totis in tam parvo agro defraudabitur. Quanta igitur fraus futura esset in agro magno?

BAR-

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Grunbergensis

PROBLEMATUM ALTIMETRICORUM

Liber Unus.

PRÆFATIO.

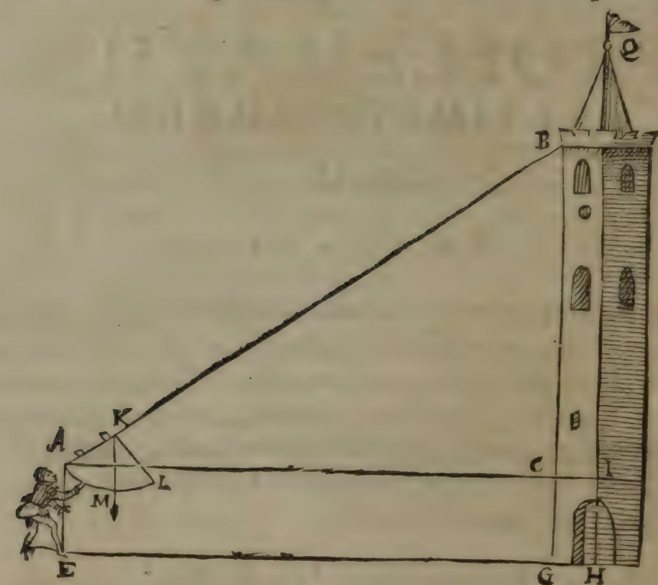
Problemata altimetrica vocabulo minus quidem Latino, ſed tamen uſitato, vocamus ea, quæ ſunt de dimenſione diſtantiæ & altitudinis, atq; hypotenuſæ quarumcunq; rerum ſub aſpectum noſtrum cadentium. Quæ dimenſio per varia inſtrumenta fieri poteſt. Nobis viſum eſt oſtendere, quomodo fiat per quadrantem uſitatum. Quorſum autem proſit, facile intelligent ii, qui ex vocatione divina debent. Cæteris exponere non eſt officii, nec inſtituti noſtri.

PROBLEMA PRIMUM.

Data diſtantia, altitudinem invenire.

Sit data diſtantia turris GB, nempe recta EG vel AC, 200. pedum. Libeat autem ſcire, quanta ſit altitudo pinnarum ejuſdem turris, nempe puncti B, ſupra oculum menſoris C vel A.

Obſervatis per quadrantem angulis AKM & MKL, quorum ille eſt æqualis angulo ABC, per 38. p. 1. & hic angulo BAC, propterea, quod ut angulus BAC, eſt complementum anguli ABC, per 52. p. 1. ita angulus MKL, eſt complementum anguli AKM, per 9. p. Æqualium autem angulorum AKM & ABC, complementa MKL & BAC, inæqualia eſſe



non poſſunt, per naturam. His, inquam, in hunc modum obſervatis: & repertis angulis ABC, 60. gr. 20. m. BAC, 29. gr. 40′. Dico compendioſiſſimè:

Ut AC. radius	—	—		100000
ad BC. tangentem anguli BAC. 29. gr. 40′.				56962
Ita AC. pedum	—	—	—	200
Ad BC. pedum	—	—	—	113 $\frac{924}{1000}$

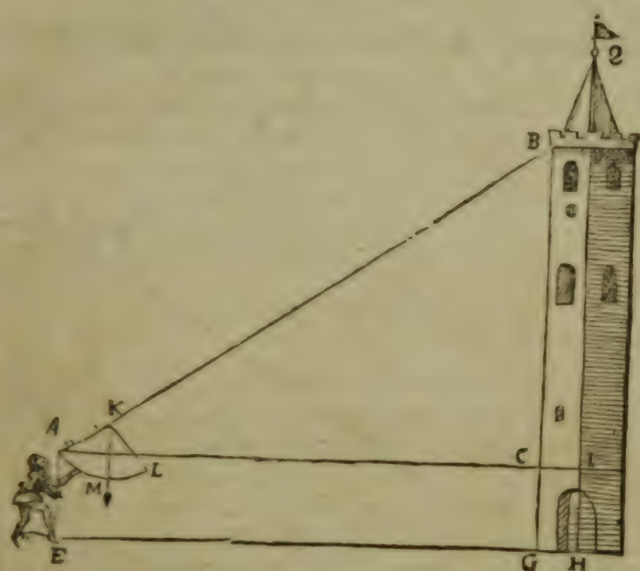
per primum axioma planorum.

NOTA.

NOTA. Si metiri libeat altitudinem globi Q. non danda erit distantia AC, sed AI, quia punctum Q. puncto C, non est perpendiculare.

PROBLEMA SECUNDUM.

Data distantia, hypotenusam invenire.



Rursum sit data distantia AC, 200. pedum, quæratur autem hypotenusa AB. quot pedum?

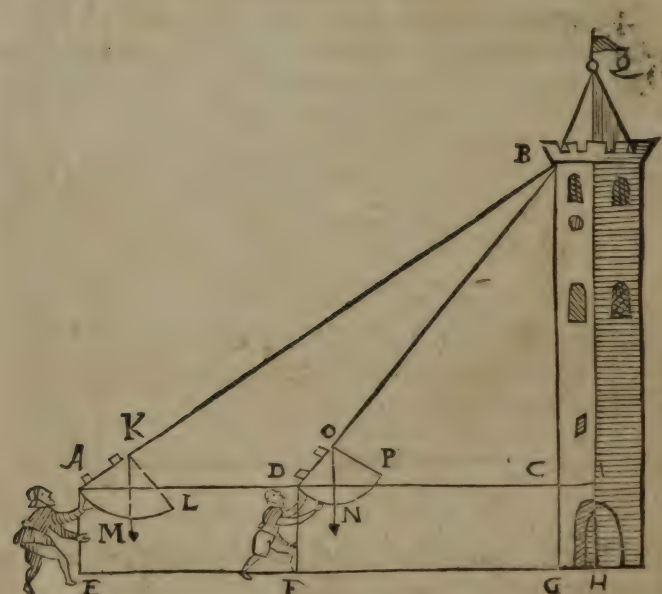
Observatis & repertis per quadrantem angulis, ut ante, dico, compendiosissimè:

Vt AC. radius	— — —	100000
ad AB. ſecantem anguli BAC. 29. gr. 40'.	—	115085
Ita AC. pedum	— — —	200
ad AB. pedum	— — — —	$230\frac{17}{100}$.

per primum planorum.

PROBLEMA TERTIUM.

Data aliqua parte diſtantiæ, reliquam diſtantiam invenire.



Sit data pars aliqua diſtantiæ AC, verbi gratia, EF, vel AD, 90. pedum: quæratur autem reliqua pars diſtantiæ, per quam

quam transire jam non liceat, propter paludes, aut fossas interjectas. Aspectâ eadem altitudine B, ex utroq; termino datæ distantiæ, nempe è puncto E & F, & observatis in prima quidem statione, angulo AKM, sive per 38. p. 1. ABC, 60. gr. 20. m. in secunda verò, angulo DON, sive per 38. p. 1. DBC, 44. gr.

Primum, de AC. tangente anguli ABC.	—	175556
subtraho DC. tangentem anguli DBC.	—	96568
Ut restet differentia tangentium AD.	—	78988

Deinde dico per 47. p. 1.

Ut AD. differentia tangentium	—	—	78988
ad DC. tangentem minorem	—	—	96568
Ita AD. differentia stationum	—	—	90 ped.
ad DC. distantiam stationis proximæ		—	110 ped.
Quam si addideris ad distantiam AD.		—	90 ped.
Habebis totam distantiam AC. vel EG.		—	200 ped.

PROBLEMA QUARTUM.

Data aliqua parte distantiæ, altitudinem invenire.

Retentis prioris observationis angulis, angulorumq; tangentibus, & tangentium differentiâ, Dico per 47. p. 1.

Ut AD. differentia tangentium	—	—	78988
ad BC. radium	—	—	100000
ita AD. differentia stationum	—	—	90 ped.
ad BC. altitudinem	—	—	114 ped. ferè.

PROBLEMA QUINTUM.

Data aliqua parte distantiæ, hypotenusam invenire.

Retentis prioris observationis terminis & angulis: primùm subtraho angulum BDC, sive per prius demonstrata NOP, 46. à duob. rectis 180. ut restet obtusus ADB, 134. gr.

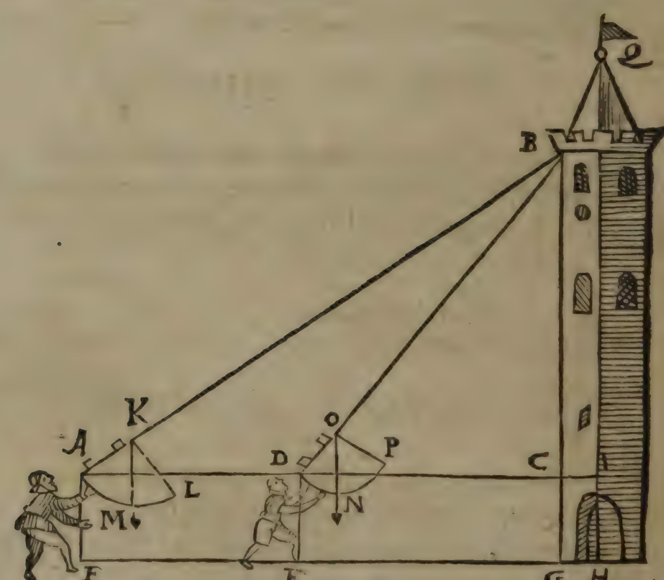
 per

per 20. p. 1. vel quod idem eſt, addo angulum DBC, 44. gr. ad angulum BCD, 90. ut reſultet inde angulus ADB, 134 gr. per 48. p. 1. Deinde addo angulum ADB, 134 gr. ad angulũ BAC, 29. gr. 40. m. ut ex ſumma duorum illorum angulorum 163. gr. 40. m. innoteſcat angulus tertius ABD, 16. gr. 20. m. Denique dico per 2. planorum:

Ut AD. ſinus anguli ABD. 16. gr. 20′. —	28122
ad AB. ſinum anguli ADB. 134. gr. —	71933
Ita AD. differentia ſtationum — —	90 ped.
ad AB. hypotenuſam — —	$230\frac{591}{28122}$.

Vel, ſi malis hypotenuſam DB.

Ut AD. ſinus anguli ABD. 16. gr. 20′. —	28122
ad DB. ſinum anguli DAB 29. gr. 40′. —	49495
Ita AD. differentia ſtationum —	90 ped.
ad DB. hypotenuſam — —	$158\frac{11274}{28122}$.



PRO-

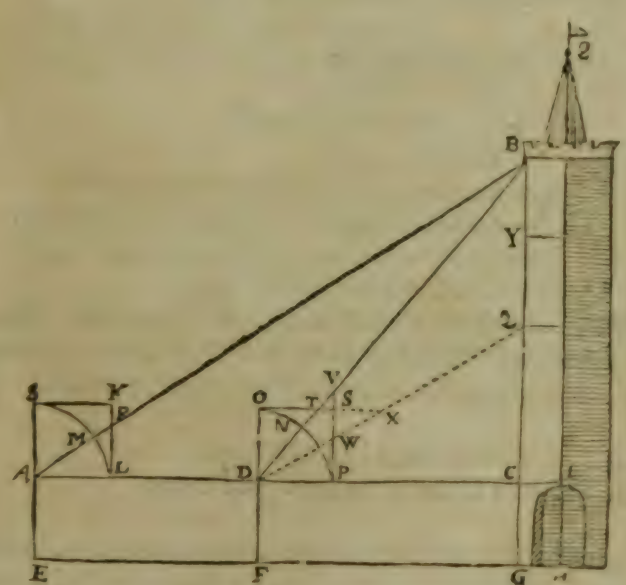
PROBLEMA SEXTUM.

Data altitudine distantiam: vel, data aliqua parte altitudinis, reliquam altitudinem, aut distantiam, aut etiam hypotenusam, inde colligere.

Inverte præcedens schema, sic ut BC sit distantia: AC, altitudo: instrumento ad casum perpendiculi convenienter applicato: & calculus erit idem.

APPENDIX.

Non erat mihi propositum quicquam de Quadrato Geometrico dicere. Sed quia in mentem venit, multos fore, qui etiam istam theoriam desiderent: En tibi eam paucis.



Latera

Latera Quadrati SK & KL, quorum illud umbra recta, hoc umbra versa vulgò dicitur, nihil aliud sunt, quàm tangentes arcuum semiquadrante minorum.

Itaque si dicas:

Ut AL, scala tota ad LR, partes æquales umbræ versæ:
ita AC, distantia ad CB, altitudinem.

Perinde est, ac si dixeris:

Ut AL, radius ad LR tangentem, ita AC, distantia ad BC, altitudinem.

Ideo autem sufficiunt tangentes arcuum semiquadrante minorũ, quia eadem est proportio tangentis ad radium, quæ radii ad tangentem complementi: per compendium calculi trigonometrici tertium. Vnde hæc duo sequuntur.

1. Si dicendum sit.
Ut DP, ad PV.
eodem effectu dici posse:
Ut TO, ad OD.
nec desiderari in tali casu tangentem PV.

2. Si omnino desideretur tangens PV vel OX.
facile hanc, vel illam, reperiri posse. Nam
Ut TO, ad OD, ita DP, ad PV. &

Ut WP, (cui æqualis est RL) ad PD, ita DO ad OX. Tunc autem desideratur interdum tangens PV, vel OX, quando dimensio fit per duas stationes. In eo enim casu, si forte dicendum sit:

Ut VW, ad WP, ita AD, ad DC, vel:
Ut TX, ad TO, ita AD, ad DC, pro libitu.

Tangentem PV, vel OX, notam esse oportet: ut inde differentia tangentium primæ & secundæ stationis elici possit, sive

ſive illæ tangentes ſint ipſorum angulorum viſionis: ut WP, (hoc eſt, KL) & PV, ſive complementorum, ut OT & GX. Nam id perinde eſt. Quia

I. Triangula compoſita DXTO & BADC, ſunt æquiangula per 35 p. 1. Ergo:

Ut XT, ad TO, ita AD ad DC, per 46. & 47. pp. 1.

II. Triangula compoſita DVWP & DBZC, ſunt æquiangula per 38. p. 1. Ergo

Ut VW, ad WP, ita BZ ad ZC, per 46. & 4. pp. 1.

Ut autem BZ, ad ZC ita AD, ad AC, per 45. p. 1. quia nempe recta DZ, eſt parallela baſi AB in Triangulo ABC.

Ergo denique:

Ut VW, ad WP, ita AD ad AC.

Nam quæ conveniunt uni tertio, etiam inter ſe conveniunt.

F I N I S.

BARTHOLOMÆI PITISCI
Grunbergensis

PROBLEMATUM
ARCHITECTONICORUM

Liber Unus.

PRÆFATIO.

ETiam in Architecturâ Trigonometria usum habet: præsertim in Architecturâ militari. Quod ut Christianis militibus ostenderem, Princeps verè CHRISTIANVS, domus Anhaltinæ columen atq; decus, à me postulavit, & suppetias etiam ad eam rem mihi tulit, tam excelso ingenio dignas. Tanti igitur Principis & favore excitatus & manuductione adjutus, faciam, quod alioqui minimè facturus eram.

PROBLEMA PRIMUM.

Data multitudine laterum arcis regularis, quantitatem angulorum circumferentiæ reperire.

Arcem hic generaliter voco quemvis locũ munitum. Neque enim aliud vocabulum Latinum suppetit, quo exprimam id quod Germanicè dicitur, **Eine Festunge.**

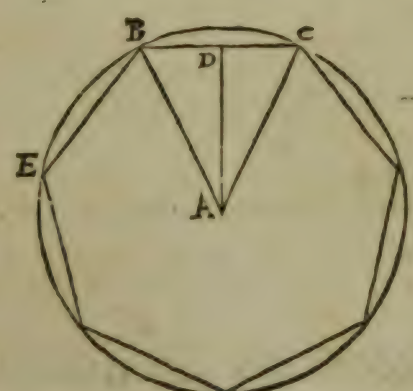
Arx

Arx regularis eſt, quæ æqualibus & lateribus & angulis conſtat, verbi gratia, quatuor, quinq; , ſex, ſeptem, octo, &c. Nam trium laterum & angulorum arx nullius eſt precii. Neq; quatuor laterum arx multum valet. Igitur ad minimum quinque laterum & angulorum eſſe debet. Quo plurium autem eſt angulorum, eo eſt ad defenſionem commodior, ut docet Speckelius Architecturæ militaris Germanicæ fol. 17. A. §. 2. ſecundæ editionis, de anno 1599.

In tali igitur arce, data multitudine laterum, quantitas angulorum circumferentiæ reperitur hoc modo.

Circulum totum arci circumſcriptum, qui circulus ſemper ponitur 360. graduum, divide per multitudinem laterum, & quotum à ſemicirculo, hoc eſt, à duobus rectis ſubtrahe: quod reſtat, erit angulus circumferentiæ arcis.

Ratio præcepti patebit ex ſubjecto exemplo. Sit arx ſeptẽ angulorum EBC. Totus circulus dividatur per ſeptẽ: quotus



erit arcus BC, menſura anguli BAC. quo detracto de duobus rectis: in triangulo plano quovis, atq; adeo etiam in triangulo ABC, exiſtentibus: relinquetur ſumma angulorum ABC & ACB: quorum angulorum unuſquiſque eſt dimidium anguli circumferentiæ por ſtructuram. Ergo ſimul ſumti exhibent ipſum angulum circumferentiæ.

Praxis.

360gr. (51.gr.
7
35
———
10
7
———
3
60
———
180 (25′
7
14
———
40
7
35
———
5
60″
———
300 43″ ferè
7
28
———
20
7.

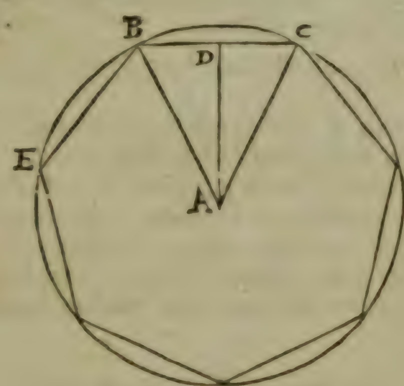
180.gr.
BAC. 51.gr.25′. 43″.
———
128.gr.34′. 17″.
ABD. 64.gr.17′. 8″$\frac{1}{2}$.
BAD. 25.gr.42′. 51″$\frac{1}{2}$.

PROBLEMA SECUNDUM.

Data quantitate laterum arcis regularis, diametrum circuli circumſcripti,

cumſcripti, ſimulq́ perpendicularem in latus arcis, atq́ hinc aream arcis invenire.

Quantitatem laterum ſingulorum uniuſcujuſque arcis regularis Speckelius vult eſſe 1000. pedum. Itali contenti ſunt 800. pedibus: ut refert idem Speckelius fol. 24. Belgæ variant. Quem nos ſequamur, ad Trigonometriam nihil intereſt. ergo Speckelii numerum retinebimus, quo retento latus BC erit 1000. pedum: ejuſque dimidium BD, erit 500. pe-



dum. Quo dato, facile erit latus AB & AD in triangulo ABC; quæ duo jam requiruntur, invenire. Nam in triangulo BAD omnes anguli dati ſunt per Problema antecedens. Poſito igitur latere dato BD, pro radio (facilioris calculi cauſa) latus AB erit ſecans, AD tangens, anguli DBA. Qui angulus in propoſito exemplo arcis ſeptem angulorum eſt 64. gr. 17'. 8'' $\frac{4}{7}$. Secans autem ejus anguli eſt *23047632*, tangens *20765195*. Dico igitur

Pro inventione lateris AB.

Ut BD radius — 10000000 | 23047632
ad AB secantem — 23047632 | 500
ita BD pedum — 500 | 1152|3816000
ad AB pedum — 1152|3816

Pro inventione lateris AD.

Ut BD radius — 10000000 | 20765195
ad AD tangentem — 20765195 | 500
ita BD pedum — 500 | 1038|2597500
ad AD pedum — 1038| 25975|

Quod multiplicatum per BD — 500

exhibet aream Trianguli ABC. 519129|87500

Quæ area multiplicata per — 7

exhibet aream totius Arcis 3633909|125

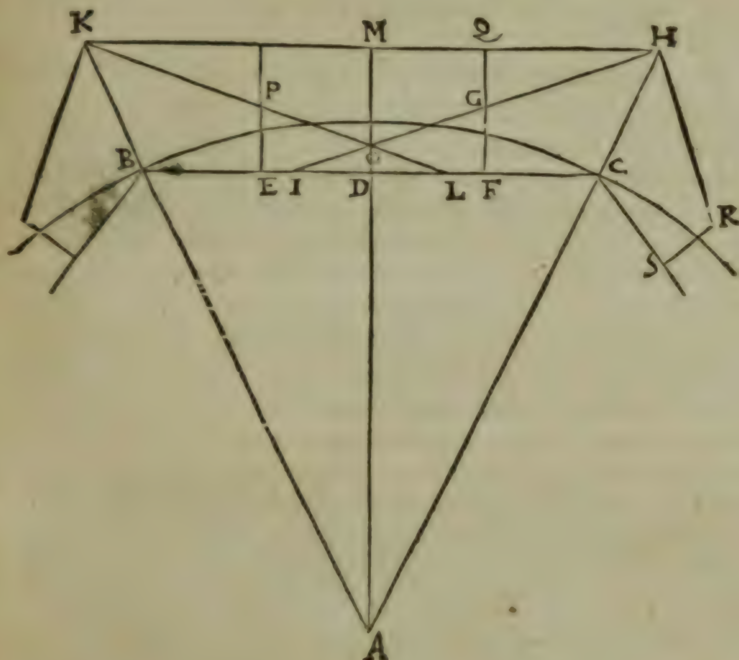
Speckelius in arce septem angulorum posito uno latere 1000. pedum invenit semidiametrum 1155. pedum. At invenire debuit 1152. pedum, error est. 3. pedum. In arce octo angulorum semidiametrum invenit 1300. pedum. At invenire debuit 1306. pedum, error est 6. pedum. In arce 16. angulorum semidiametrum invenit 2580. pedum. at invenire debuit 2563 . pedum, error est 17. pedum. Tantùm trigonometria mechanicis operationibus præstat.

PROBLEMA TERTIUM.

Partes præcipuas arcis, nempe cortinam, faciem, alam & angulum propugnaculi rectè constituere.

Cortina est linea sive longitudo valli inter duo propugnacula interjecta: qualis est hic linea EF. propugnaculum est FGHRS. facies propugnaculi est GH. ala FG. collum FC. Angulus propugnaculi est angulus GHR. Qui angulus vulgò dicitur

dicitur angulus defensus, sive defendendus: respectu anguli KOH, qui vulgo dicitur angulus defendens.



Posito igitur latere arcis BC 1000. pedum, Speckelius cortinam vult esse 500. faciem 400. alam 150. pedum.

Alii à facie propugnaculi incipientes eam volunt esse in arce maxima 400. in mediocri 350. in minima 300. pedum. Deinde facie pro libitu assumtâ, cortinam volunt continere quinque quartas, & alam duas quintas faciei. Quæ propor-

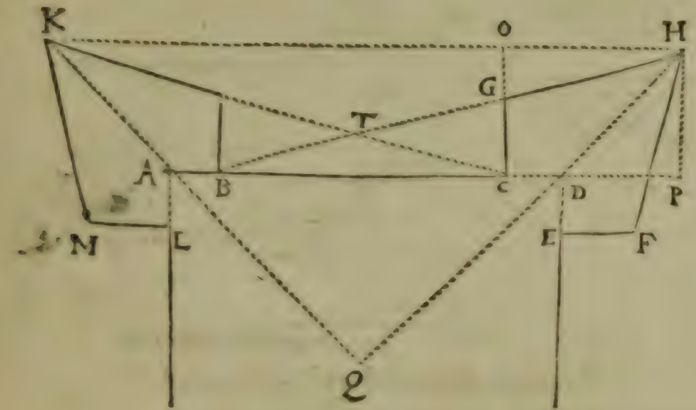
proportio cum Speckeliana propè convenit. Nam si faciem 400. pedum dividas in quatuor partes, hoc est, in quater centum pedes, cortina, si sit 500 pedum, exactè continebit quinq; talium partium. Sin eandem faciem 400. dividas in quinque partes, duæ quintæ efficient 160. pedes. quæ parum absunt à 150. pedibus.

Alii, diviso latere arcis in quinq; partes, cortinæ tribuunt hujusmodi partes 3. faciei 2. alæ $0\frac{3}{4}$ (hoc est $\frac{1}{4}$ cortinæ.) Qua ratione collo propugnaculi utrinque relinquitur pars una.

Angulum propugnaculi Speckelius semper vult esse rectum. Erhardus de Bar le duc itidem. Atqui in arce quadrangula vel quinquangula id locum habere nullo modo potest: ut ipsimet fatentur: imò in arce etiam sexangula vel septangula difficulter. Ideò præceptum illud de arce octo vel plurium angulorum inprimis est intelligendum. Itali plerique angulum propugnaculi faciunt obtusum, quod is sit cæteris firmior. In Belgio sunt artifices nobilissimi, qui angulum propugnaculi pro ratione anguli circumferentiæ arcis variandum esse censent: sic nimirum, ut quanto magis aperiatur angulus circumferentiæ, tantò magis etiam aperiatur angulus propugnaculi. Absurdum enim esse putant, ut angulo circumferentiæ crescente, angulus propugnaculi non simul crescat. In arce igitur quadrangula; quippe omnium minima; quia angulus circumferentiæ est minimus, nempe tantum 90. graduum, etiam angulum propugnaculi minimum esse volunt; Minor autem nunquam esse debet, quàm sexaginta graduum. Angulus ergo propugnaculi sive angulus defensus arcis regularis quadrilateræ erit 60. graduum. Quo posito angulus defendens necessario erit 150. graduum. Sit enim arx quadrilatera ABCDE &c. Quia igitur angulus GHF. ponitur 60. graduum: atque adeo angulus GHD. 30. graduum; angulus autem OHD, est 45. graduum; quippe æ-

qualis

qualis angulo CDQ. propter rectas OH & CD. parallelas: ideo angulus OHG. necessario est 15. graduum. Nam si 30.



subtrahas de 45. restant 15. Atqui anguli OHG sive OHT & OKT sunt æquales: per structuram. Ergo simul sumti complent 30. gradus: quibus de 180. gradibus subtractis, restant pro angulo KTH. 150. gradus: Quod demonstrandum erat.

In arce igitur omniũ minima, nempe quadrangula, ubi angulus circumferentiæ est rectus: angulus defensus est 60. defendens 150. graduum. In cæteris arcibus, quæ angulum circumferentiæ habent recto majorem, angulum defensum & defendentem, secundum illos, sic inquires.

Subtrahe angulum circumferentiæ minimum, hoc est 90. gradus, ab angulo circumferentiæ propositæ arcis: relicti dimidium adde ad minimum angulum defensum, hoc est ad 60. gradus; idemque dimidium aufer à maximo angulo defendente,

dente, nempe à 150. gradibus; & acquires iſtâ quidem operatione angulum defenſum, hâc verò angulum defendentem propoſitæ arcis.

Exemplum primum arcis quinquangulæ.

360 (72 gr.	180 gr.
5	72
35	108 Angulus circumferentiæ.
10	90
5	18
	dimid. 9
	60
	69 Angulus defenſus.
	150
	Idē dimid. 9
	141 Angulus defendens.

Exemplum ſecundum arcis ſexangulæ.

360 (60 gr.	180
6	60
	120 Augulus circumferentiæ.
	90
	30
	15
	60
	75 Angulus defenſus.
	150
	15
	135 Angulus defendens.

Exemplum tertium, arcis ſeptangulæ.

260 gr.	180
7 (51 gr.	51. gr. 25'. 43".
35	

10
7
3
60′
180 (25′
7
14
40
7
35
5
60″
300 (45 ferè.
7
28
20
7

128. gr. 34′. 17″½ Angulus circumferentiæ.
90
38 gr. 34′. 17″½
19. gr. 17′. 8″½
60 gr.
79. gr. 17′. 8″½ Angulus defensus.
150. gr.
19. gr. 17′. 8″½
130. gr. 42′. 51″½ Angulus defendēs.

Hâc ratione angulus defensus non prius fit rectus, quàm ventum sit ad arcem duodecim angulorum, Sed fit tamen recto proximus: quod satis est: & angulus defendens non fit nimis obtusus: quod planè vitiosum esset: Nam ut angulus defensus, quò rectior eò melior, ita angulus defendens, quò acutior eò melior. Sic igitur anguli defensi perfectio curanda est, ut anguli etiam defendentis perfectioni, quantum fieri potest studeatur.

Cæterum, si in inquisitione angulorum festinandum sit, sume duas tertias anguli circumferentiæ pro angulo propugnaculi: nec multum à scopo aberrabis: ut sequens calculus ostendet.

Angulus circumferentiæ.	Quadrang.	Quinq.	Sexang.	Sept.	Octang.
	90.	108.	120	129.	135
Una tertia	30.	36.	40.	43.	45
Duæ tertiæ	60.	72.	80.	86.	90.

Porrò, dicta proportio linearum & angulorum ſimul quidem conſiſtere poteſt, quamdiu principium lineæ defenſionis incertum relinquitur, nec ad concurſum alæ & cortinæ alligatur. At, ſi lineam defenſionis ex ipſo concurſu alæ & cortinæ perpetuò ductam velis, certa linearum ſimul & angulorum proportio obſervari non poteſt. Nam ſi dixero:

Multiplicatio.

Ut cortina 3.
ad alam $\frac{3}{4}$.
ita radius 10000000.
ad tangentē 2500000.

$\frac{3}{4}$ — $\frac{10000000}{1}$ | $\frac{300\ \&c.}{4}$

Diviſio per 3.

$\frac{1}{3}$ — $\frac{30000000}{4}$ | $\frac{300\ \&c.}{12}$

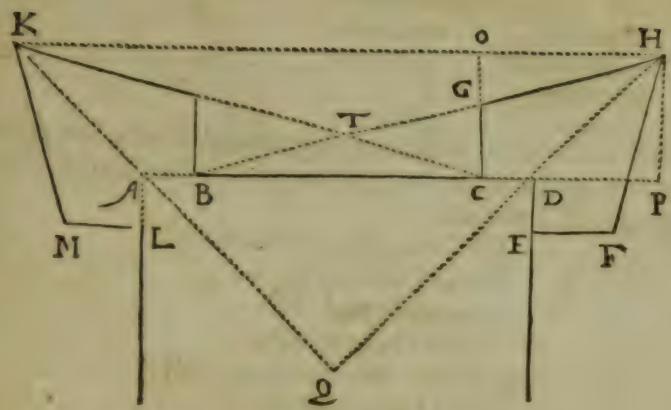
30000000 (2500000
12
2.4
60
12

Prodibit angulus à cortina & linea defenſionis comprehenſus. 14 gr. 2'. 10. At debebat eſſe
In quadrangulo 15. gr.
In quinquangulo 19. gr. 30'.
In ſexangulo 22. gr. 30'.
In ſeptangulo 24. gr. 39'. & ſic deinceps.

Igitur in tali caſu, quando nimirum linea defenſionis ex concurſu alæ & cortinæ ducenda eſt, vel lineæ angulis, vel vel anguli lineis cedant oportet. Quod ſi ergo angulos retinere cupis inconcuſſos, alæ quantitatem pro ſingulis multangulis peculiariter inquiras, hoc modo. Angulus à cortina & linea defenſionis comprehenſus: nempe in ſchemate tertio angulus GBC: eſt, ut modo diximus:

		Tangentes illorum angulorum ſunt.
In quadrangulo	15 gr.	2679492.
In quinquangulo	19 gr. 30'.	3541186.
In ſexangulo	22 gr. 30.	4142136.
In ſeptangulo	24 gr. 39.	4588917.

Dico



Dico igitur:

Pro quadrangulo.

Ut radius.	10000000	2679492—3
ad tangentem.	2679492	3—3
Ita cortina.	3	8038476—0
ad alam.	$\frac{4}{5}$	1|0000000

Pro quinquangulo.

Ut radius.	10000000	3541186—1
ad tangentem	3541186	3—3
Ita cortina.	3	1|0623558—3
ad alam.	$1\frac{6}{100}$	1|0000000

Pro ſexangulo.

Ut radius.	10000000	4142136—3
ad tangentem.	4142136	3—3
Ita cortina.	3	1|2426408
ad alam.	$1\frac{1}{4}$	

Pro ſeptangulo.

Ut radius.	10000000	4588917—6
ad tangentem.	4588917	3—3
Ita cortina.	3	1|3766781
ad alam.	$1\frac{2}{5}$ &c.	

Alâ ſic inventâ, ſi faciem vis immutabiliter eſſe duarum partium, qualium cortina eſt trium, variabit collum: & quantitas ejus ſic reperietur:

I. Ut GH. radius ad ſinum GO.
Ita GH. 2. ad GO -----
Quo addito ad GC----
Fit OC. vel HP ---

II. Ut GH. radius ad ſinum HO
Ita GH. 2. ad HO vel CP ----

III. Ut HP radius ad PD tangentem
Ita HP partium ---- ad PD
Quo demto de CP.

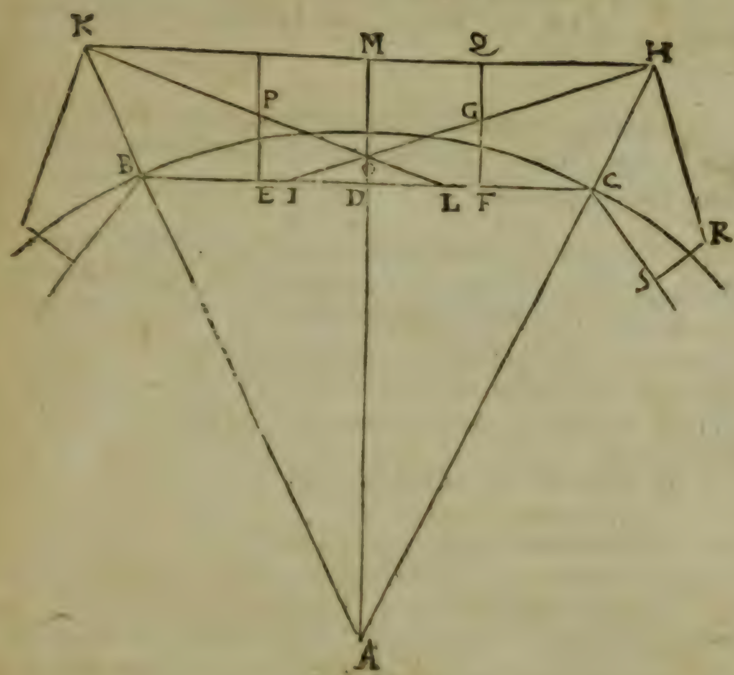
Relinquitur CD.

Exemplum hujuſce calculi videbis infra, ſub finem problematis decimiſeptimi.

PROBLEMA QUARTUM.

Qualeſcunque dentur, cortina, facies, ala, atque angulus propugnaculi: quanta futura & in quam partem cortinæ caſura ſit linea defenſionis, invenire.

In priore ſchemate problematis antecedentis latus BC ſit latus arcis ſeptangulæ. Angulus igitur B A C erit 51. gr. 25'. 43". Angulus verò BAD 25. gr. 42'. 51"$\frac{1}{2}$. quippe dimidius anguli BAC, Angulus denique ABD erit 64. gr. 17'. 8"$\frac{1}{2}$: quippe anguli BAD complementum: omnia, per problema primum. Ponatur jam angulus propugnaculi GHR 84. gr. 16'. angulus igitur



igitur GHC erit 42. gr. 8. Quem si subtrahas ab angulo QHC. qui est æqualis angulo DCA. 64. gr. 17′. 8″½. restabit angulus QHG. 22. gr. 9′. 8″½. Cujus complementum est angulus QGH. 67. gr. 50′. 51″½. cui æquatur angulus FGI. unde liquet triangula QGH. & FGI. esse prorsus æquiangula: quod & structura indicat. Porrò, si angulum QGH 67. gr. 50′. 51″½. subtrahas à duobus rectis, restabit obtusus FGH. 112. gr. 9′. 8″½. Si eundem angulum QGH. vel MOH duplum sumas, habebis obtusum KOH 135. gr. 41′. 43″. Denique si angulum DCA

64. gr.

64.gr.17′.8″$\frac{1}{2}$. ſubtrahas à duobus rectis, habebis obtuſum FCH.115.gr.42′.51″$\frac{1}{2}$. Atque ita omnes anguli in hac figura noti erunt.

De lateribus, datum ſit latus arcis BC. 1000. cortina EF 500. facies GH. 400. ala FG 150. pedum, ex Speckelii inſtituto. Latera igitur DF & FC ſingula erunt 250. pedum.

Quibus ita poſitis primum inquiratur longitudo lineæ defenſionis IH, hoc modo: In Triangulo IGF. datum eſt latus GF 150. pedum, dati ſunt etiam anguli FGI & FIG: ille quidem 67.gr.50′.51″$\frac{1}{2}$. hic verò 22.gr.9′.8″$\frac{1}{2}$. Ponatur igitur latus datum FG. pro radio; Quo facto latus IG erit ſecans anguli FGI.67.gr.50′.51″$\frac{1}{2}$. Atqui illius anguli ſecans eſt 26520216. Dico igitur

Ut FG radius	10000000	26520216—6
ad GI ſecantem	26520216	150—6
ita FG pedum	150	1326010800
ad GI pedum	397|80324	26520216
Quo addito ad GH	400	397|8032400—0
efficitur IH	797|80324	

longitudo lineæ defenſionis: quam circiter 800. pedum artifices eſſe volunt, nempe pro ictu bombardæ furca ſuſtentatæ.

Deinde inquiratur, in quam partem cortinæ linea defenſionis incidat. h. e. quantum diſtet punctum I. à puncto E. ſive quanta ſit recta EI?

Eaq; inquiſitio inſtituatur hoc modo.

In eodem Triangulo IFG. & eodem latere FG pro radio poſito, ut IG eſt ſecans, ita IF eſt tangens anguli FGI. 67.gr. 50′.51″$\frac{1}{2}$. Atqui tangens illius anguli eſt 245626 10 Dico igitur;

UtFG

Ut FG radius	10000000	24562610 -- 8
ad FI tangentem	24562610	150 -- 6
Ita FG pedum	150	1228130500
ad FI pedum	368|43915	2456261
Quo detracto de FE	500|00000	368|4391500 -- 3

Relinquitur EI pedum 131|56085. distantia inter lineas defensionis ab ala. Quam distantiam alii artifices multò minorem, nempe tantùm duodecim pedum aut circiter: nonnulli etiam planè nullam esse volunt. At invenias exempla viva arcium exactissimè munitarum, in quibus distantia EI. sit plus quam 200. pedum, & perparum à medio cortinæ distet.

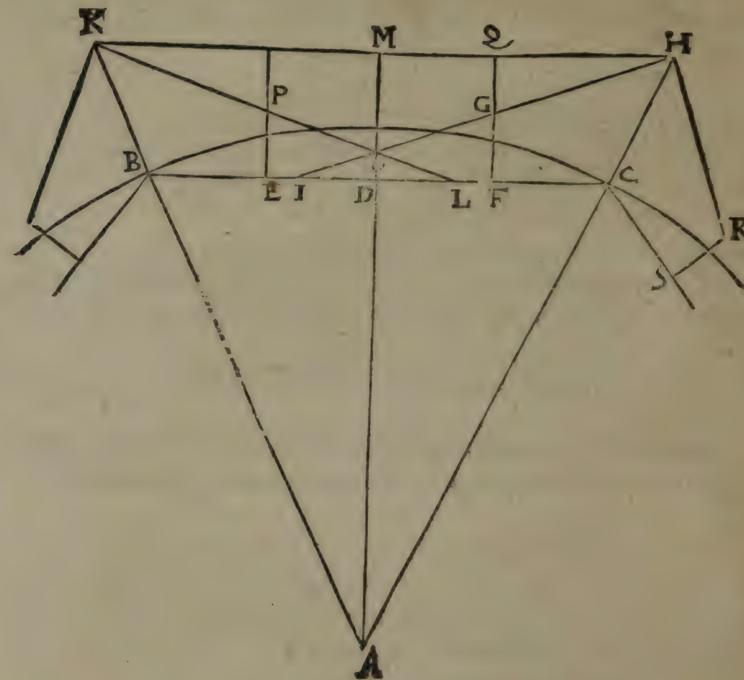
PROBLEMA QUINTUM.

Ex iisdem datis punctum decussationis duarum linearum defensionis, quantum & à latere arcis & ab extremitate alæ distet, invenire.

Punctum illud in hoc nostro schemate & punctum O. distantia ejus à latere arcis est recta DO. ab extremitate verò alæ recta OG. Hæ igitur duæ lineæ nempe recta DO & recta OG. hoc loco quæruntur. Inventio autem earum tota consistit in solutione trianguli IOD. in quo quia latus ID. jam notum est, vel certe notum esse potest per Problema antecedens. Nam, si

repertam ibi rectam EI	131|56085
subtraxeris à recta ED	250|
Restabit recta ID	118|43915

Pono hoc latus ID pro radio. Qua positione latus DO erit tangens, IO. secans, anguli DIO. 22. gr. 9'. 8''½. per problema antecedens. tangens autem illius anguli est 4071228. secans 10796987. Dico igitur.



I. Ut ID radius —	10000000
ad DO tangentem	4071228
Ita ID pedum —	118|43915
ad DO pedum —	48|21928

11843915 — 5
4071228 — 6

94751320
23687830
23687830
11843915
82907405
47375660

48|21927|8377620 -- 3.

II. Ut ID radius —	10000000
ad IO secantem —	10796987
ita ID pedum —	118|43915
ad IO pedum —	127|87859
Quo detracto de IG	397|80324
Relinquitur OG —	269|92465
Quo addito ad GH	400|
efficitur OH —	669|92465

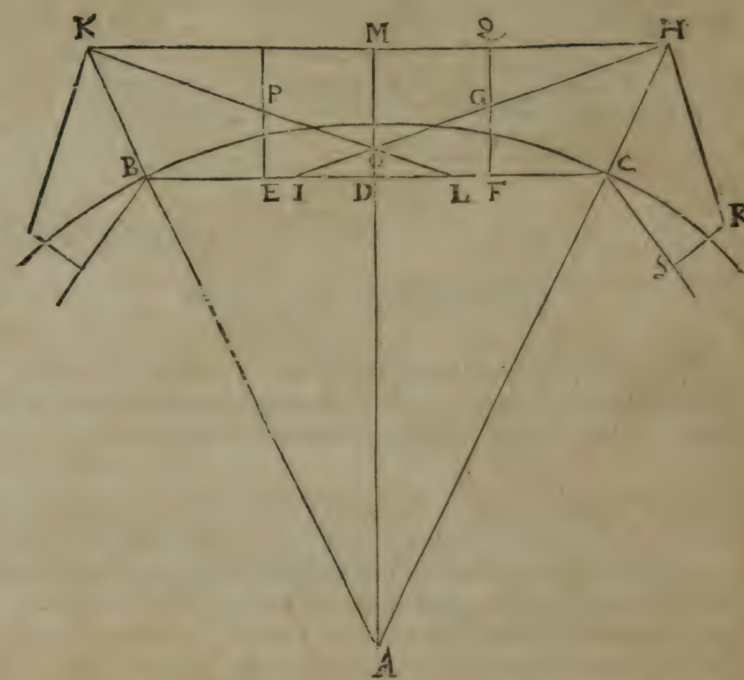
11843915 — 5
10796987 — 2
82907405
94751320
106595235
71063490
106595235
82907405
11843915
127|87859|6284105 — 1

PROBLEMA SEXTUM.

Extremorum propugnaculorum distantiam, & à se invicem & à centris suis; atque etiam à centro arcis, simulque perpendicularem à centro arcis in rectam extrema propugnacula connectentem, invenire.

Extrema propugnacula voco extremitates sive cuspides propugnaculorum, nempe puncta K & H quorum punctorum distantia ab invicem est recta KH, distantia vero eorundem illorum punctorum à suis centris, hoc est, à centris propugnaculorum B & C sunt rectæ BK & CH. distantia porrò punctorum illorum à centro arcis est recta AK vel AH; perpendicularis denique à centro arcis in rectam KH est recta AM. Ad quas lineas omnes inveniendum opus est solutione triangulorum GQH & AMH.

In triangulo GQH. præter omnes angulos nota est etiam hypotenusa GH. qua pro radio posita latera GQ & QH sunt sinus oppositorum ipsis angulorum, qui sinus ita habent ut sequitur.



Anguli minoris GHQ 22 gr. 9'. 8"$\frac{1}{2}$. ſinus eſt 3770709.
Anguli majoris GQH 67. gr. 50'. 51"$\frac{1}{2}$. ſinus eſt 9261844.

Dico igitur,

I.	Ut GH radius	—	10000000		
	ad GQ ſinum	—	3770709		3770709 — 6
	Ita GH pedum	—	400		400 — 4
	ad GQ pedum	—	150	82836	150, 8283600 — 6
	Quæ addito ad FG	—	150		

Efficitur

Efficitur QF vel MD —	300|82836	
Quo rursum addito ad AD	1038|25975	
efficitur AM —	1339|08811	
II. Ut GH radius —	10000000	9261844
ad QH sinum —	9261844	400
Ita GH pedum —	400|	370|4737600
ad QH pedum —	370|47376	
Quo addito ad MQ —	250|	
efficitur MH —	620|47376	
Cujus duplum est KH	1240|94752	

.distantia extremorum propugnaculorum à se invicem.

In triangulo AMH nota jam sunt duo latera, nempe latus AM, & latus MH. Noti etiam sunt omnes anguli: nempe angulus MAH. 25. gr. 42'. 51''½. ejusque complementum MHA. 64. gr. 17'. 8''½. Posito igitur latere AM pro radio, AH erit secans anguli 25 gr. 42'. 51''½. Quæ secans ex canone desumta est partium 11099163. Dico igitur

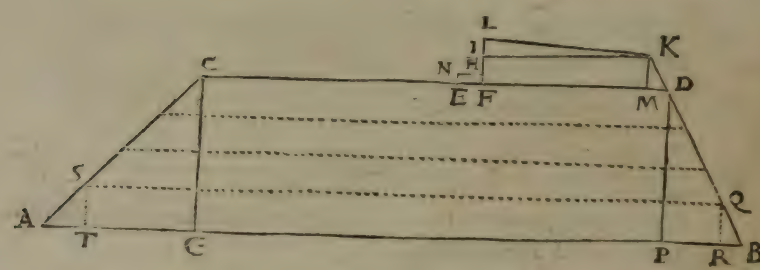
Ut AM radius —	10000000	1339|08811—7
ad AH secantem	11099163	110|99163—3
Ita AM pedum —	1339|08811	4017|26433
ad AH pedum —	1486|27572	80345|2866
Unde si detraxeris		133908|811
AC	1152|38160	12051792|99
		120517929|9
		133908811
		133908811
Relinquitur CH	333|89412	1486|27572|0425193—3.

PROBLEMA SEPTIMUM.

Valli latitudinem & altitudinem rectè constituere.

Ista

Iſta pro ratione & materiæ & formæ & ſitus arcis variant. Nos in exemplum proponemus vallum, cujus altitudo CG.



ſit 20. pedum, latitudo maxima AB 90. minima CD 60. acclivitas interior AG altitudini æqualis. nempe 20. pedum: acclivitas exterior PB. ad altitudinem ſubdupla, nempe 10. pedum. Loricæ latitudo maxima FD 24. minima IK 22. pedum: acclivitas MD 2. pedum, altitudo FI vel MK. 4. pedum IL. 2. FL 6. pedum. Scamni latitudo EF 3. pedum: altitudo EN. unius pedis.

PROBLEMA OCTAVUM.

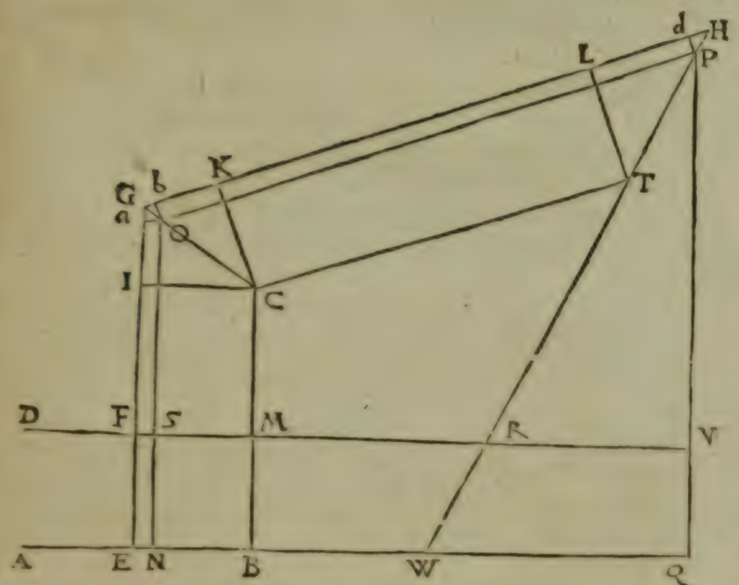
Longitudinem valli interiorem ad datam latitudinem inveſtigare.

Longitudo valli exterior DFGH, jam ſupra data eſt, nempe

DF	250.
FG	150.
GH	400.
Tota DFGH	800. pedum.

Longitudo valli interior ABCT ad datam latitudinem AD. 90. pedum jam quæritur.

Quia



Quia igitur data eſt latitudo AD, & illi æquales EF, BM. FM & EB. Ideò ſi

ad AE	— —	250
addas EB	—	90
habebis AB	—	340
Item ſi ad FG	— —	150
addas EF	— —	90
habebis EG	—	240
Unde ſi auferas IG		
reſtabit EI vel BC		

Sed IG incognita eſt, ergo per Trigonometriam inquiratur, hoc modo.

In trian-

In triangulo IGC (cui æquatur triangulum CKC per structuram) notus est angulus IGC. per problema I V. dimidius nempe obtusi IGK,

qui obtusus IGK erat	111 gr 9′ 8″½. ergo	
acutus IGC erit	55 gr. 34′. 34″	Hujus verò
Complem. ICG erit	34 g. 25′ 26″.	

Notum est præterea latus IC 90. pedum.

Posito igitur hoc latere IC. pro radio, latus IG erit tangens anguli ICG. quę tangens in canone reperitur partiũ 6853268 Dico igitur.

Ut IC radius —	10000000		6853268
ad IG tangentem —	6853268		90
Ita IC pedum —	90		61 | 6794120
ad IG pedum —	61	679412	
Quo sublato de EG	240	000000	
Restabit EI vel BC. —	178	320588	
Unde si rursum auferas BM —	90		
Restabit CM — —	88	320588	
Item, sublato GK —	61	679412	
de GH —	400		
Restat KH — —	338	320588	

Unde si auferam LH.

Relinquetur KL sive CT.

Sed LH. rursus ignoratur: nec nisi per Trigonometriam indagari potest.

Notus autem est in Triangulo TLH. per problema IV. angulus LHT. 42. gr. 8′. Et ejus complementum angulus LTH. 47. gr. 52′. cujus tangens de canone est, 11054284. Dico igitur

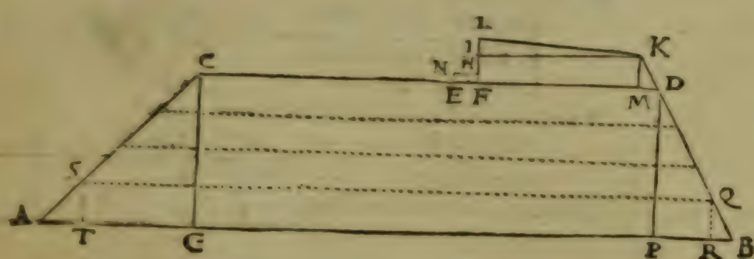
Ut TL radius — —	10000000		11054284
ad LH tangentem —	11054284		90
Ita TL pedum —	90		99 | 4885560
ad LH pedum —	99	488556	
Quo subtracto de KH	338	320588	

Restabit

Restabit KL sive CT —	238	832032
Cui adde CB — —	178	320588
& AB — —	340	
Et habebis totam ABCT	757	15262

PROBLEMA NONUM.

Aream sectionis valli reperire.



Imaginē sectionis valli refert schema ex problemate VII. hûc repetitum. Cujus schematis aream ex datis in eo lineis ita quàm facilimè invenies.

Valli absque loricâ longitudo

maxima est AB	—	90 ped.
minima CD	—	60
		150
media —	—	75
Altitudo CG	—	20
Area ABCD	—	1500

In lorica, trapezii FIKD longitudo
maxima est FD — 24.ped.
minima IK — — 22.ped.

46.

media — — 23.ped.
altitudo FI — — 4.ped.

Area FIKD — — 92.ped.
In triangulo IKL latus IK est — 22.ped.
dimidium latus IL est — 1.ped.

Ergo area ILK est — — 22.ped.
Cui adde aream FIKD — 92.ped.

Et habebis totam aream
loricæ sine scamno — 114.ped.
Scamni EFNH latitudo EF est — 3.ped.
Altitudo EN — — 1.ped.

Area EFNH — — 3.
Cui adde aream loricæ reliquæ — 114.

Et habebis aream loricæ cum
scamno — 117.
Cui adde reliquam aream valli 1500.

Et habebis aream sectionis totius
valli — 1617.pedum quadratorum.

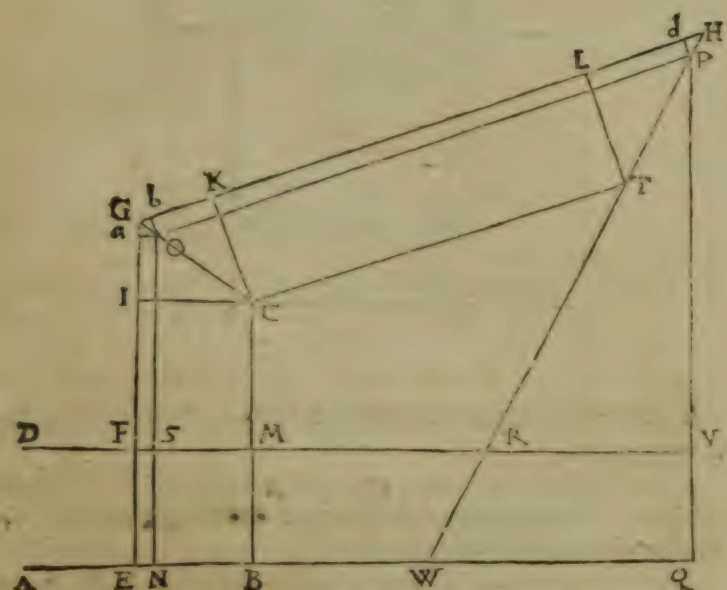
PROBLEMA DECIMUM.

Corpus valli totum reperire.

Corpus valli intra curvaturas facilimè invenitur: multiplicando scilicet aream sectionis valli per longitudinem valli minimam. Ut, longitudo valli minima à medio cortinæ usque
ad alam, est AE — — 250 ped.
In ala ipsa CM — — 88,320588
In facie GT — — 238,832032

Summa

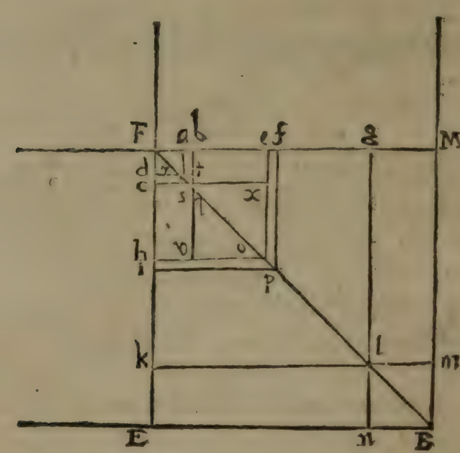
Summa —	577	15262
Area ſectionis valli — —		1617
	4040	06834
	5771	5262
	346291	572
	577152	62
Corpus valli intra curvaturas exiſtens	933255	78654



nempe à medio cortinæ D uſque ad F, & ab F uſque ad I, & denique à K uſque ad L. Sed curvaturarum corpus indagare, hoc opus hic labor eſt: ſi quis non proximum vero,

 ſed

ſed ipſum verum ſcire appetiverit. Sic autem procedes, ſi te appetitus iſte inceſſerit.



Ante omnia corpus valli ipſius & tùm demum corpus loricæ inquires.

Corpus valli ut invenias, primum aream valli ſupremam indagato; Deinde eam per altitudinem multiplicato, & habebis corpus valli perpendiculare.

Suprema area valli eſt, quæ conſiſtit intra lineas d r a, & k l g. quas lineas jam noſti ex plana ſectione valli, ad problema nonum annotata.

Linea nempe d r. vel r a. eſt linea acclivitatis valli exterioris, diſtans ab ambitu valli exteriore 10. pedibus, & tranſiens in ſchemate planæ ſectionis valli per punctum P.

Linea

Linea k l vel l g est linea acclivitatis valli interioris, distans ab ambitu valli exteriore 70. ab interiore 20. pedibus; & transiens in plana sectione valli per punctum G.

Inventio igitur areæ talis erit.

Longitudo minima d r	—	10
& r a	—	10
maxima k l	—	70
& l g	—	70
Aggregatum	—	160
Longitudo media	—	80
Latitudo CK	— —	60
Area	—	4800
altitudo	—	20
Corpus valli perpendiculare		96000

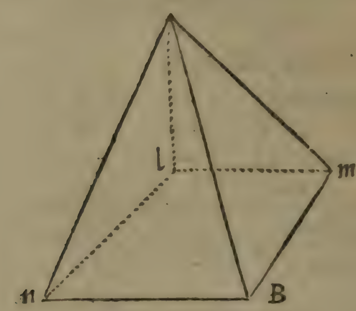
Deinde corpus acclivitatis valli interioris à k vel g usq; ad l inquiras, hoc modo.

longitudo k l	—	70
latitudo l n	—	20
Area E k l n	—	1400
altitudo	— —	20
Corpus utriusque		28000

acclivitatis: nempe & ejus quæ consistit in basi E k l n. & ejus quæ consistit in basi l g M m.

Tertiò inquire corpus pyramidis simplicis circa angulum B. super basi l n B m consistentis, cujus delineatio optica talis est.

 Inven-



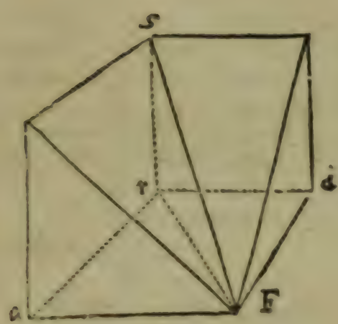
Inventio autem ſtereometrica talis eſt.

l n.		—	20
n B.		—	20
plana baſis	—	—	400
Altitudo	—	—	20
Priſma	—	—	8000
Pyramis	—	—	2666|66666. triens ſcilicet

priſmatis baſi & altitudine æqualis per 7.p.12. Euclid. ſive per 5. Elementum 23. libri Geomet. Rami.

Quartò, inquire corpus duplicis pyramidis circa angulum F in baſi F d r a. conſiſtentis, cujus delineatio optica talis eſt.

Inven-



Inventio autem ſtereometrica talis eſt.

FD.	—	10	
dr.	—	10	
plana baſis a r d F	—	100	
Altitudo r s	— —	20	
Priſma	— —	2000	
Pyramis ſimplex	—	666	66666
duplex	—	1333	33332

(Nota in angulis curvaturárum externis, quales ſunt ad G & H, acclivitates efficiunt pyramides ſimplices. In angulis verò internis, quales ſunt ad FC. & T. acclivitates efficiunt duplices pyramides, cujus rei cauſam melius non intelliges, quàm ſi cubo ligneo in tres pyramides diſſecto, & pyramidibus illis ad angulos curvaturarum tùm externos tùm internos accommodatis, ipſis oculis tuis magiſtris utâris.)

Iam

Iam collige in unam summam hujus curvaturæ sive juncturæ

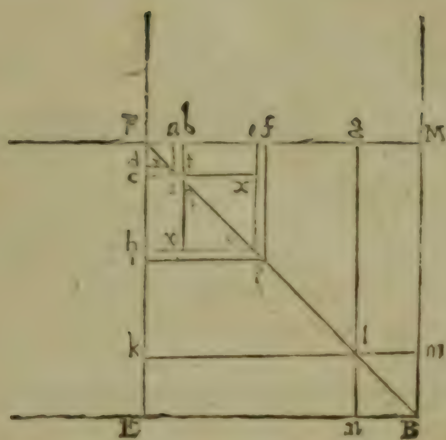
corpus perpendiculare	—	96000
corpus acclivitatum	— —	28000
Pyramidem simplicem	—	2666|66666
Pyramidem duplicem	— —	1333|33333
Et habebis totum corpus valli sine lorica, in ista quidem curvatura consistentis, pedum cubicorum ferè — —		127999|99999 128000

Hinc loricæ corpus investiga, atq; ibi rursum ante omnia inquire corpus perpendiculare hoc modo.

Ejus longitudo est cq	—	12
qb	—	12
ho	—	34
oe	—	34
Aggregatum	—	92
Longitudo media	—	46
Latitudo eh	—	22
		92
		92
plana basis	—	1012
Altitudo	— —	4
corpus perpendiculare		4048

Deinde inquire corpora triangularia corpori perpendiculari utrinque insistentia usq; ad pyramidem, hoc modo.

dimidia



dimidia longitudò h.v.
&xe — — 12
latitudo vq — — 22

24
24

plana basis — — 264
altitudo — — 2

corpus — — 528

Tertiò inquire corpus duplicis pyramidis interpositæ, hoc modo.

longitudo vq — — 22
latitudo qx — — 22

44
44

h plana

plana basis	484	
Altitudo	2	
prisma	968	
pyramis	322	66666
duplum	645	33333

Quartò inquire corpus acclivitatum loricæ, hoc modo.

longitudo dimidia c s	10
latitudo r s	2
plana basis	20
altitudo	4
corpus	80

Quintò inquire duplicem pyramidem acclivitatis loricæ, hoc modo.

longitudo r s	2	
latitudo s q	2	
plana basis	4	
Altitudo	4	
prisma	16	
pyramis	5	33333
duplex pyramis	10	66666

Postremò inquire corpus scamni, hoc modo.

longitudo h o	34
c e	34
i p	37
p f	37
aggregatum	142

longitudo

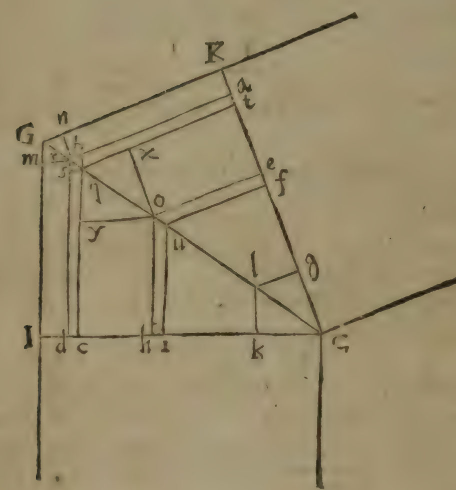
longitudo media — —	71
latitudo — — —	3
Area — — —	213
altitudo — — —	1
corpus — — —	213

Iam collige in unam summam omnia, quæ ad loricam pertinent, hoc modo.

loricæ corpus perpendiculare —	4048	
corpus triangulare suprapositum —	528	
corpus duplicis pyramidis interpositæ —	645	33333
corpus acclivitatum — —	80	
corpus duplicis pyramidis — —	10	66666
corpus scamni — — —	213	
corpus totius loricæ — —	5524	99999
adde corpus valli — —	127999	99999
Et habebis totum corpus huic curvaturæ conveniens —	133524	99999

Quâ curvaturâ expeditâ pergamus ad alteram, cujus plana basis talis est, qualem apposita figura ostentat. In qua figura pleræque lineæ necessariæ hactenus ignotæ per Trigonometriam inquirendæ sunt, hoc modo. Triangula inibi existentia omnia sunt æquiangula per structuram: Et datus est in eis angulus ad C. existens 34. gr. 25'. 26". ejusque tangens 6853268. per problema octavum. datæ etiam sunt bases IC. dc. hC &c. per problema septimum.

Ad inveniendum igitur perpendicula rd. qc. &c. (Nam perpendiculum G. I. jam notum est per problema octavum) Dico.



I. Ut CD radius —	10000000		6853268 — 2
ad d r tangentem —	6853268		80—8
Ita C d — —	80		54|8261440—7
ad d r — —	54	826144	
Quo ſubtracto de IG —	61	679412	
Relinquitur m G —	6	853268	

II. Ut C c radius — —	10000000		6853268--2
ad c q tangentem —	6853268		78—6
Ita C c — — —	78		54826144
ad c q — —	53	45549	47972876
Quo ſubtracto de d r —	54	82614	53|4554904—3
Relinquitur s r — —	1	37065	

III. Ut

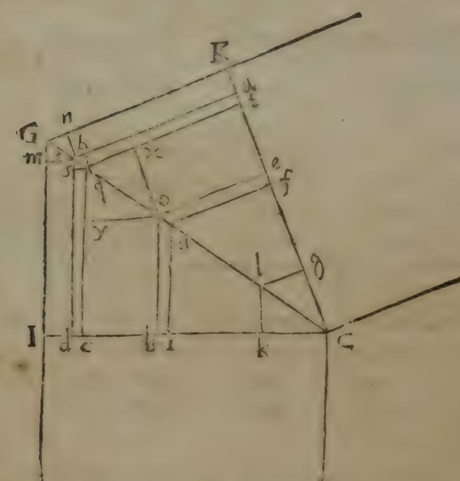
III. Ut C h radius	—	10000000	6853268--2
ad h o tangentem	—	6853268	56--2
Ita C h	— —	56	41119608
ad h o	— —	38|37830	34266340
Quo subtracto de c q	—	53|45549	38|3783008-4
Relinquitur y q	—	15|07719	
			6853268--2
IV. Ut C i radius	— —	10000000	53--8
ad i u tangentem	—	6853268	20559804
Ita C i	— —	53	34266340
ad i u	— —	36|32232	36|3223204-7

V. Ut C k radius	—	10000000	6853268
ad k l tangentem	—	6853268	20
Ita C k	— —	20	13|7065360
ad k l	— —	13|706536	

His ita præparatis, primum inquire corpus perpendiculare valli, hoc modo.

longitudo d r	—	54|826144
r a	—	54|826144
k l	—	13|706536
l g	—	13|706536
Summa longitudinum		137|06536
longitudo media	—	68|53268—2
latitudo k d	—	60—6
plana basis	—	4111|96080—3
Altitudo	— —	20
Corpus valli perpendiculare		82239|21600

Deinde inquire corpus acclivitatis externæ I m & n k, hoc modo.



loṅgitudo dimidia I m vel d r	—	54	826144
latitudo I d	— — —		10
plana basis	— — —	548	261440
Altitudo	— — — —		20
corpus acclivitatis externæ d r a	—	10965	228800

Tertiò inquire pyramidem in angulo acclivitatis externæ consistentem, hoc modo.

latus I G	—	61	679412
d r vel I M	—	54	826144. subtrahe.
restat m G	—	6	853268
m r	—		10
plana basis r m G n	—	68	532680
Altitudo	— —		20

prisma

prisma	—	1370	653600
pyramis	—	456	884533

Quartò inquire pyramidem duplicem in angulo interiore ad C consistentem, hoc modo.

k l	—	13	706536
k c	—		20
plana basis	—	274	130720
Altitudo	— —		20
prisma	—	5482	614400
triens	—	1827	538133
bes	—	3655	076266

Iam collige in unam summam

Corpus perpendiculare	—	82239	2160
Corpus acclivitatis externæ	—	10965	2288
Corpus pyramidis interpositæ	—	456	8845
Corpus acclivitatis sive duplicis pyramidis internæ	—	3655	0763
Corpus totius valli in ista quidem curvatura absq; tamen lorica	—	97316	4056

Corporis loricæ inquisitio.

Corporis perpendicularis longitudo maxima c q	—	—	53	45549
& q t	—	—	53	45549
minima h o	—	—	38	37830
& o e	—	—	38	37830
aggregatum	—	—	183	66758
longitudo media	—	—	91	83379
latitudo c h	—	— —		22.
			183	66758
			1836	6758

plana

plana basis — —	2020	34338
Altitudo — — —		4
Corpus loricæ perpendiculare	8081	37352

Corporis triangularis suprapositæ.

longitudo h o & v e dimidia	38	3783
latitudo c h — —		22
	76	7566
	767	566
plana basis — —	844	3226
Altitudo — — —		2
Corpus — —	1688	6452

Pyramidis interpositæ.

longitudo y q — —	15	07719
latitudo y o — —		22
	30	15438
	301	5438
plana ba sis o y q x —	331	69818
Altitudo — —		2
prisma — —	663	39636
pyramis — —	221	13212

Acclivitatum loricæ.

longitudo dimidia est c q	53	45549
latitudo d c — —		2
plana basis — —	106	91098
altitudo — — —		4
corpus — —	427	64392

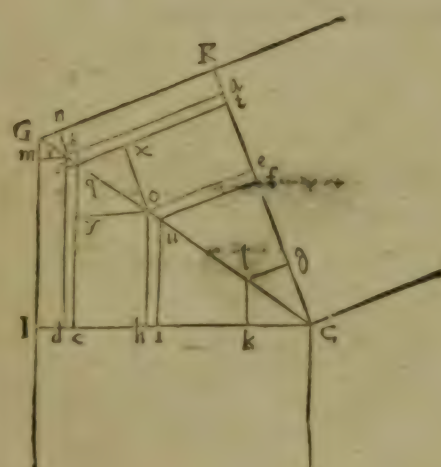
Pyramidis interpositæ.

longitudo s r — —	1	370654
latitudo s q — —		2

plana

plana basis	— —	2	741308
altitudo	— —		4
Prisma	— —	10	965232
Pyramis	— —	3	655077
Scamni longitudo maxima est h o		38	3783
& o e		38	3783
minima i u		36	3223
& u f		36	3223
Summa	—	149	4012
longitudo media	—	74	7006
latitudo	— —		3
Area & corpus	—	224	1018

nam altitudo i. nihil multiplicat.

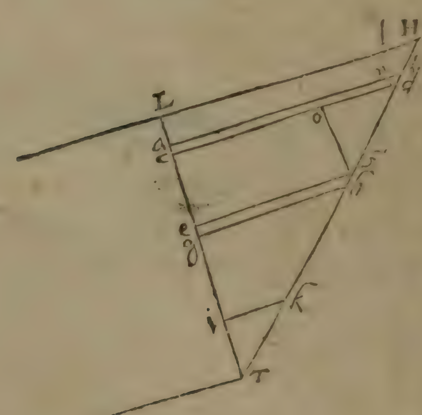


Collectio corporis loricæ in unam ſummam.

	8081	3735—8
	1688	6452—4
	221	1321—3
	427	6439--8
	3	6551—2
	224	1018--0
corpus loricæ	10646	5516—7
corpus reliqui valli	97316	4056
corpus totius valli ſecundæ curvaturæ conveniens	107962	9572

Reſtat ultima curvatura ad H. ad cujus expeditionem rurſus trigonometriâ opus eſt propter perpendicula LH, n b &c. in triangulis inibi exiſtentibus ignota.

Quæ perpendicula ſic inveniuntur.



Notus

Notus eſt in illis triangulis angulus ad H exiſtens 42. gr. 8. per Problema IV. Notus igitur etiam erit angulus ad T exiſtens: illius nempe complement. m 47. gr. 52. Notæ ſunt præterea baſes LT, o f, &c. per Problema VII. Poſitis igitur baſibus pro radiis, & deſumto ex canone tangente anguli 47. gr. 52. quæ tangens eſt 11054284 quia perpendiculum LH jam notum eſt, ex Problemate VIII. pergo ad reliqua, & dico.

I. Ut T a radius	10000000	
ad a b tangentem	11054284	
Ita T a	80	
Ad a b	88|4342720	
Quo ſublato de LH	99|488556	
Reſtat i H	11|054284	

II. Ut T c radius	10000000	11054284—7
ad c d tangentem	11054284	78—6
Ita T c	78	88434272
ad c d	86|2234152	77379988
Quo ſublato de a b	88|4342720	86|2234152—6
Reſtat n b	2|2108568	

III. Ut T e radius	10000000	11054284—7
ad e f tangentem	11054284	56—2
Ita T e	56	66325704
ad e f	61|90399	55271420
Quo ſublato de c d	86|22341	61|9039904—5
reſtat c d	24|31942	

IV. Ut T g radius	10000000	11054284—7
ad g h tangentem	11054284	53—8
Ita T g	53	33162852
ad g h	58|5877	55271420
		58|5877052—2

V. Ut Ti radius — 10000000
ad i k. tang. — 11054284
Ita T i — — — 20

ad i k — — 22|1085680

His ita factis iterum primo loco valli, deinde loricæ corpus inquiro.

Valli corpus ita inquiro. Corporis perpendicularis
longitudo maxima est a b 88|43427
minima i k 22|10857

110|54284

media — 55|27142
latitudo a i — 60

plana basis corporis perpendicularis
3316|28520 — 3
Altitudo — 20
Igitur corpus perpendiculare est 66325|70400 — 6

Acclivitatis exterioris a b.
longitudo tota — 88|43427
dimidia — 44|21713
latitudo l b — — 10

plana basis — 442|17130
altitudo — — 20

corpus — — 8843|42600

Pyramidis exterioris longitudo LH tota 11|05428
dimidia — — 5|52714
latitudo l b — — — 10

plana basis — — 55|27140
Altitudo — — 20

Prisma — — 1105|42800
Pyramis — — — 368|476

Duplicis Pyramidis interioris longitudo
i k est — — 22|108568
latitudo T i dimidia est — — 10

plana

plana basis est	221	085680
altitudo est		20
prisma est	4421	713600
pyramis simplex	1473	904533
pyramis duplex	2947	809066
huic adde	66325	704
	8843	426
	368	476

Et habebis totum corpus valli,

absque lorica	78485	415

Loricæ corpus sic inquiro.

Corporis in ea perpendicularis

longitudo maxima c d est	86	22341
minima e f est	61	90399
	148	12740
media	74	0637---0
latitudo e c		22---4
	148	1274
	1481	274
plana basis	1629	4014—0
altitudo		4
corpus	6517	605[illegible]
Acclivitatis c d longitudo tota est	86	22341
dimidia	43	11170
latitudo a c		2
plana basis	86	22340
altitudo		4
corpus	344	8936

Parvæ pyramidis isti acclivitati adhærescentis

longitudo n b est	2	2108
latitudo n d dimidia	1	
plana basis	2	2108
altitudo	4	

prisma	8	8432
pyramis	2	9474
Corporis triangularis plana basis	1629	4014
altitudo	2	
prisma	3258	8028
pyramis	1086	2676
huic adde	6517	6056
	344	8936
	2	9474
Et habebis totum corpus loricæ	7951	7142
cui adde corpus valli	78485	4150
& habebis totum corpus hujus dimidiæ curvaturæ	86437	129

Iam collige in unam summam.

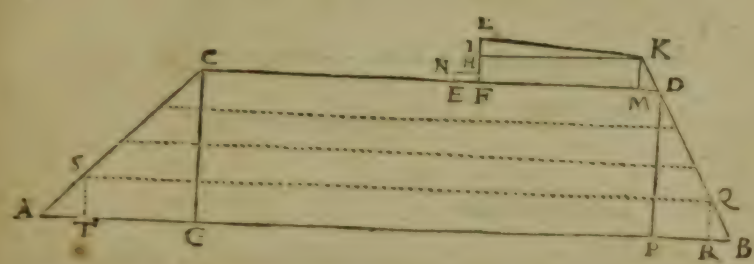
corpus intra curvaturas	933255	78654—3
corpus primæ curvaturæ ad F	133524	99998—8
corpus secundæ curvaturæ ad G	107962	95720—3
corpus tertiæ curvaturæ ad H	86437	12900—4
Et habebis totum corpus valli circa decimamquartam partem ambitus totius arcis	1261180	87272—0
		14
Quod corpus multiplicatum	5044723	49088
per 14. corpus totius valli	1261180 8	7272
circa totam arcem exhibebit;	17656532	21808
		100000

pedum cubicorum, quos pedes cubicos deinde vel in decempedas vel in duodecempedas vel in sexdecempedas rediges: pro tuæ regionis consuetudine & usu. Unde tamen spatium portis destinatum subtrahendum esse memineris.

PRO-

PROBLEMA UNDECIMUM.

Partem corporis valli quamlibet ab horizonte utcunque distantem invenire.



Exempli gratia. Primò quęratur, quantum terræ contineat pars valli quinq; pedes alta & ducentos pedes longa proximè horizontem? Respondetur sic

latitudo maxima AB est	90 pedum.
minima S Q	$82\frac{1}{2}$.
	$172\frac{1}{2}$.
media	$86\frac{1}{4}$.
altitudo S T	5
	430
	$1\frac{1}{4}$.
plana sectio ASQB	$431\frac{1}{4}$.
longitudo	200
	86200
	50
corpus quæsitum	86250

Secundò

Secundò quæratur, quantum terræ contineat pars valli ſequens ejuſdem & altitudinis & longitudinis? reſpondetur

latitudo maxima	82½.
minima	75
	157½.
media	78¾.
altitudo	5
	390
	3¾.
plana ſectio	393¾.
longitudo	200
	78600
	150
corpus quæſitum	78750

Tertio, quæratur pars corporis valli tertia ad eandem & altitudinem & longitudinem? ſolutio quæſtionis ſic eſt,

Latitudo maxima	75
minima	67½.
	142½.
media	71¼.
Altitudo	5
	355
	1¼.
plana ſectio	356¼.
longitudo	200
corpus quæſitum	71250

Quartò: quæratur ſuprema pars valli ad eandem & altitudinem & longitudinem,

Jatitudo maxima	67½
minima	60

	$127\frac{1}{2}$.
media	$63\frac{3}{4}$.
Altitudo	5
	315
	$3\frac{3}{4}$.
plana sectio	$318\frac{3}{4}$.
longitudo	200
	63600
	150
corpus quæsitum	63750

Quintò: quæratur loricæ corpus ad longitudinem ducentorum pedum.

plana sectio loricæ est	117
longitudo	200
corpus desideratum	23400

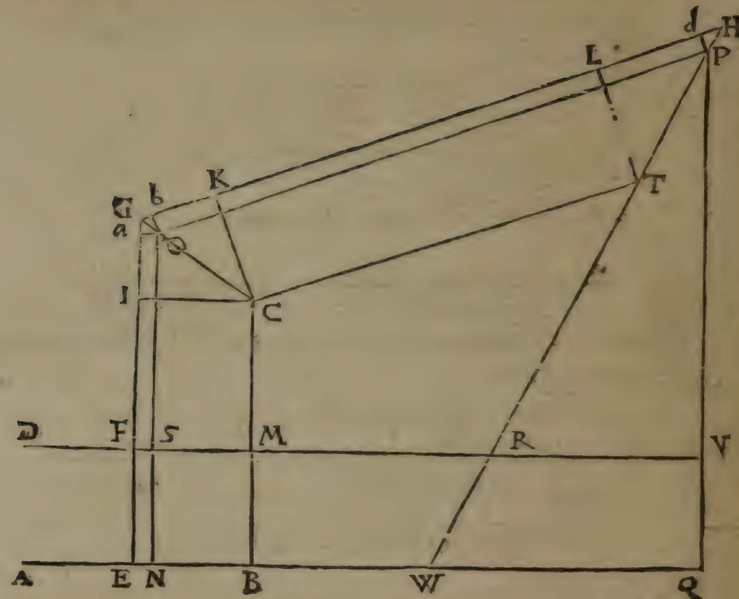
PROBLEMA XII.

Propugnaculi solidi corpus invenire.

Principio inquiras corpus perpendiculare quod intrà lineas NOPW continetur: deinde acclivitatem SO & OP: itemque pyramides ad G & H denique loricam.

Corpus perpẽdiculare ut invenias, ante omnia lineas NO. OP. PR. PQ. SV. PW & WQ cognitas habeas oportet.

Lineam NO. sic cognosces. Nota est recta e G 240. composita ex longitudine alæ FG 150. & latitudine valli EF 90. At recta NO. est recta EG minus segmento aG. Hoc igitur segmentum inquiratur beneficio trianguli OaG: in quo triangulo angulus ad O cum sua tangente notus est per problema VIII. nempe angulus ipse 34 gr. 25'. 26". Tangẽs ejus 6853268. Dico igitur.



Ut O a radius	10000000	
ad a G tangentem	6853268	
Ita O a acclivitas	10	
ad a G	6	8532680
Quo demto de e G	240	
Relinquitur NO	233	146732

Lineam OP ſic cognoſces. Nota jam eſt recta GH 400. ped. notum eſt etiam ſegmentum inde auferendum Gb. æquale nempe ſegmento Ga. per ſtructuram. Notum deniq; eſt in triangulo PdH pro inveniendo ſegmento dH latus Pd 10. ped. & angulus dPH 47. gr. 52'. per Problema VIII. ejuſq; tangens de canone 11054284. Dico igitur.

Ut

Ut d p radius		10000000
ad dH tangentem		11054284
Ita d P pedum	10	
ad dH ped.	11	0542840
huic adde Gb	6	853268
Et hanc summam	17	907552
aufer de GH	400	
relinquitur OP	382	092448

Linea HR nota est per Problema VI. ubi inventa fuit pedum 333|89412 Unde si auferas segmentum PH. relinquetur linea PR. Quod segmentum PH sic invenies. Notus est in triangulo angulus dPH & latus dP. Hoc igitur posito pro radio PH est secans anguli dPH 47.gr 52′. Quæ secans de canone talis est 14906280. Dico igitur.

Ut radius dP	10000000	
ad PH secantem	14906280	
Ita dP	10	
ad PH	14	9062800
Quo demto de HR	333	8941200
relinquitur PR	318	98784

Lineas PQ & SV aliter cognoscere non potes, quam ex triangulo RPV, in quo triangulo notus est angulus RPV æqualis dimidio angulo ad centrum arcis, nempe angulo schematis secundi DAC. qui angulus Problemate primo inventus fuit 25 gr. 42′51″$\frac{1}{2}$. Notum est etiam latus subtendens rectum RP. Eo igitur pro radio posito latera includentia rectum RV & VP erunt sinus oppositorum ipsis angulorum: qui sinus in tabulis ita habent.

Anguli RPV 25 gr. 42′.51″$\frac{1}{2}$. sinus	4338841
complementi PRV sinus	9009687

 Dico

Dico igitur.

<table>
<tr><td>I. Ut RP. radius</td><td>10000000</td><td>3— 31898784</td></tr>
<tr><td>ad RV. ſinum</td><td>4338841</td><td>4— 4338841</td></tr>
<tr><td>Ita RP</td><td>318|98784</td><td>31898784</td></tr>
<tr><td>ad RV</td><td>138|40375</td><td>127595136</td></tr>
<tr><td>Quo addito ad FR</td><td>250|</td><td>255190272</td></tr>
<tr><td>Fit FV vel EK</td><td>388|40375</td><td>255190272</td></tr>
<tr><td></td><td></td><td>95696352</td></tr>
<tr><td></td><td></td><td>95696352</td></tr>
<tr><td></td><td></td><td>127595136</td></tr>
<tr><td></td><td></td><td>138|40375|1869344</td></tr>
</table>

<table>
<tr><td>II. Ut RP. radius</td><td>10000000</td><td>3— 31898784</td></tr>
<tr><td>ad RV. ſinum</td><td>9009687</td><td>3- — 9009687</td></tr>
<tr><td>Ita RP</td><td>318|98784</td><td>223291488</td></tr>
<tr><td>ad RV</td><td>287|39806</td><td>255190272</td></tr>
<tr><td>Quo addito ad VQ</td><td>90|</td><td>191392704</td></tr>
<tr><td>Efficitur PQ</td><td>377|39806</td><td>287089056</td></tr>
<tr><td></td><td></td><td>287089056</td></tr>
<tr><td></td><td></td><td>287|39805|9520608-0</td></tr>
</table>

Ultimam lineam WQ ut invenias in triangulo WPQ, pone latus PQ pro radio, & latus WQ erit tangẽs anguli WPQ 25. gr. 42′. 5″ $1\frac{1}{2}$. quæ tangens ſecundum canonem eſt partium 48,5751. Dices igitur.

<table>
<tr><td>Ut PQ. radius</td><td>10000000</td><td>7— 37739806</td></tr>
<tr><td>ad WQ. tangentem</td><td>4815751</td><td>4 — 4815751</td></tr>
<tr><td>Ita PQ</td><td>377|39806</td><td>37739806</td></tr>
<tr><td>ad WQ</td><td>181|74551</td><td>188699030</td></tr>
<tr><td></td><td></td><td>264178642</td></tr>
<tr><td></td><td></td><td>188699030</td></tr>
<tr><td></td><td></td><td>37739806</td></tr>
<tr><td></td><td></td><td>301918448</td></tr>
<tr><td></td><td></td><td>150959224</td></tr>
<tr><td></td><td></td><td>181|74550|8484306-1</td></tr>
</table>

His lineis

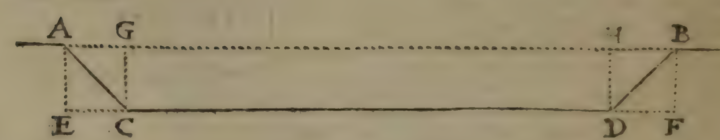
His lineis sic inventis primum aream trapezii NOPQ deinde aream trianguli VVPQ inquires, & hanc ab illa subtrahes, quodq; restabit per altitudinem suam [illegible] multiplicabis, & habebis corpus perpendiculare. hoc modo.

longitudo minima NO	233	14673	
maxima PQ	377	39806	
	610	54479	
longitudo media	305	27239 — 4	
latitudo FV vel EQ	388	40375 — 2	
	1526	36195	
	21369	0673	
	91581	717	
	122	10895	6
	2442	17912	
	24421	7912	
	91581	717	
area trapezii	118568	94104	74625 — 8
Trianguli longitudo tota PQ	377	39806	
longitudo dimidia	188	69903 — 8	
latitudo WQ	181	74551 — 5	
	188	69903	
	9434	9515	
	94349	515	
	7	54796	12
	132	08932	1
	188	69903	
	15095	9224	
	18869	903	
Area trianguli	34295	20144	38553 — 4
area Trapezii	118568	94104	
area dimidii propugnaculi supremae	84273	7396	
Altitudo	20		
corpus perpendiculare	1685474	7920	

Acclivitatum, pyramidum, & loricæ inventio hic eadem eſt, quæ fuit problemate X. Iſthinc ergo repetet qui volet.

PROBLEMA XIII.

Foſſæ & latitudinem & profunditatem definire.



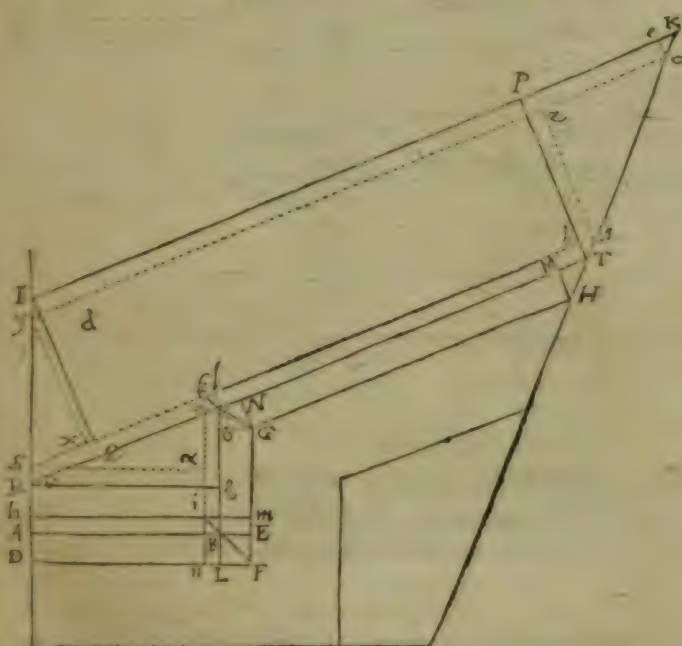
Foſſa non tantum pro ſcopo arcis, ſed etiam pro ratione terræ, quæ ad vallum congerendum requiritur, & pro ratione ſubjecti ſoli vel arenoſi vel ſcaturiginoſi vel petricoſi, & ſecundum latitudinem & ſecundum profunditatem variè definiri ſolet. Nos exempli gratia proponemus foſſam cujus latitudo ſuprema AB ſit 200. pedum, infima CD 160. pedum. Altitudo ſive profunditas AE 20. declivitas EC. itidem 20. pedum.

PROBLEMA XIV.

Data latitudine foſſæ ambitum ejus & interiorem & exteriorem invenire.

A vallo uſque ad foſſam ſpatium horizontale vacuum triginta aut circiter pedes latum relinqui & loricâ peculiari muniri ſo-

niri solet. Itaq; ambitus fossæ interior non est vallo contiguus, nec in eandem cum illo lineam incidit. Sit ergo ambitus valli exterior DFGH. Fossæ ambitus interior ABCT exterior IK. Ambitus valli exterior DF.GH. datus est. Ambitus fossæ uterq; quæritur. Et primum quæritur linea ABCT vel potius differentia ejus à linea DFGH. quæ differentia consistit in segmentis LF, FE, OC, CN, MT quorum segmentorum inventio jam est obvia per Problema VIII. & breviter ita habet.



I. LF &

I. LF & EF singula sunt 30. ped. quippe latitudo plani horizontalis data.

II. Ut OG. radius	10000000		6853268 — 2
ad OC tangentem	6853268		30 — 3
ita OG	30		20|5598040 — 6
ad OC vel CN	20	5598	

III. Ut HM radius	10000000		11054284 — 7
ad MT tangentem	11054284		30 — 3
Ita HM	30		33|1628520 — 3
ad MT	33	1628	
Cui adde CN	20	5598	
Et fit	53	7226	
Quod adde ad GH	400		
Et fit CT	453	7226	
Deinde de FG	150		
Subtrahe EF	30		
& remanet EG	120		
Cui adde OC	20	5598	
Et fit BC	140	5598	
Deniq; de DF	250		
aufer LF	30		
Et remanet DL vel AB	220		
Cui adde BC	140	5598	
& CT	453	7226	
Et habebis totam ABCT	814	2824	ambitum nempe fossæ interiorem.

Ambitus fossæ exterior, nempe recta IK deinceps quæritur, quæ recta IK ut inveniatur, prænoscenda est recta RT. cujus pars CT. jam cognita est; pars altera RC sic accipitur. In tri-

In triangulo RCg. notus eſt angulus CRg 22. grad. 9'. 8''½. per problema IV. & ejus de canone ſecans 10796986. Dico igitur.

Ut Rg radius	10000000		10796986
ad Rc ſecantem	10796986		220
Ita Rg	220		215939720
ad Rc	237	533692	21593972
Quo addito ad CT	453	722600	237|5336920
Fit RT	691	256292	

Hinc inveſtiganda eſt differentia rectæ IK. à recta RT. hoc modo.

In triangulo RIQ angulus RIQ idem eſt cum angulo CRg. per ſtructuram. Tangens autem illius anguli eſt 4071228. Dico igitur.

Ut IQ radius	10000000		4071228
ad QR tangentem	4071228		200
Ita IQ	200		81|4245600
ad QR	81	42456	
Quo demto de RT	691	25629	
relinquitur QT vel IP	609	83173	

In triangulo TPK angulus ad K (idem qui ad H.) cum ſua tangente jam pridem notus eſt (nempe per problema IV. & VIII.) Dico igitur.

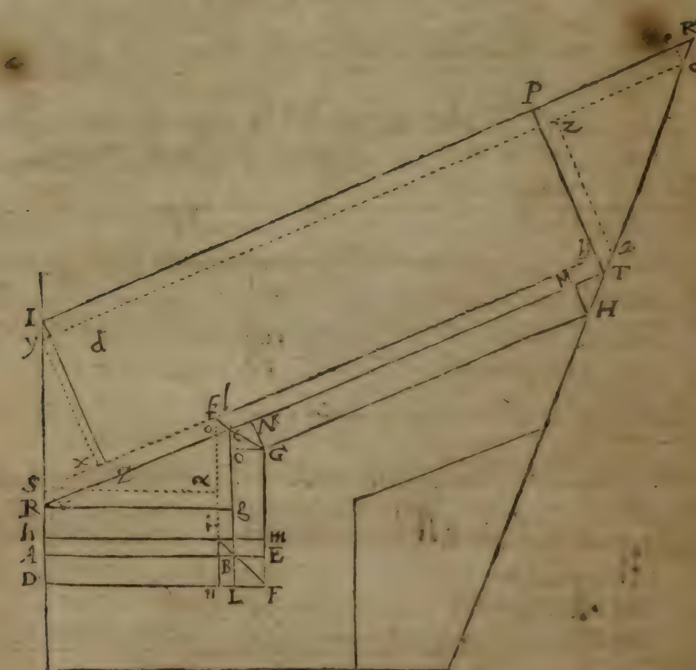
Ut TP radius	10000000
ad PK tangentem	11054284
Ita TP	200

ad PK	221|08568
Quo addito ad IP	609|83173
efficitur IK	830|91741. decima quarta

pars ambitus fossæ exterioris.

PROBLEMA XV.

Fossæ capacitatem indagare.



Princi-

Principio inquire capacitatem perpendicularem secundum latitudinem minimam, quæ est in fundo; deinde capacitatem acclivitatum & pyramidum illis interjacentium.

Capacitatem perpendicularem ut accipias, aream fossæ infimam multiplica per suam altitudinem. Aream autem fossæ infimam intellige, quæ inclusa sit lineis ih, hy, yc, ca, ak, ki, quarum linearum quædam ad calculum sunt necessariæ, quædam non. Ad calculum necessariæ sunt lineæ ih, hs, ik, yc, yx, & præterea linea Sα, quas lineas omnes sic invenies.

Linea h i est linea AB. minus nL. ergo.

De linea AB	220
Subtrahe lineam nL	20
Et restabit linea h i	200

Linea ik est linea BC. minus m E. & plus o k.

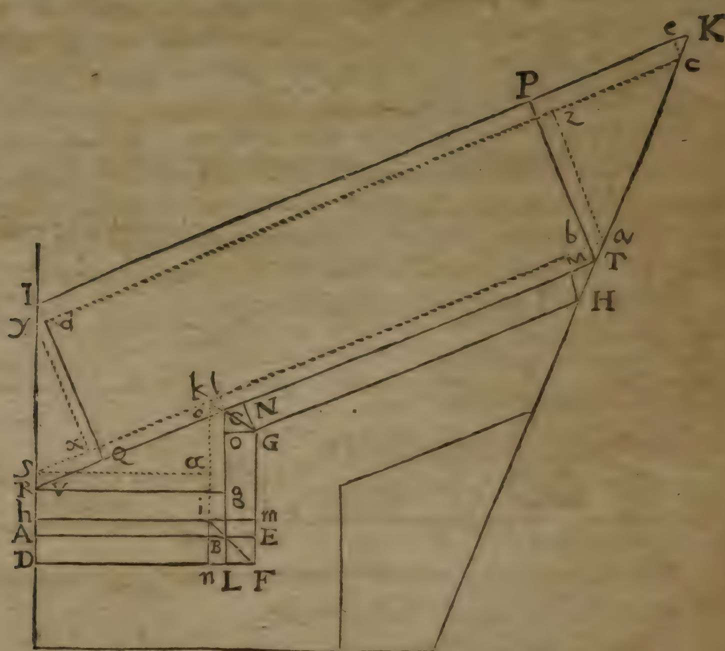
Atqui BC est	140|5598.	per Problema antecedens.
mE est	20|	
Ergo io est	120|5598	

Restat inquirendum ok quod invenitur juxta exempla Problematum VIII. & X. hoc modo.

Ut Co radius	10000000
ad o k tangentem	6853268 — 2
Ita Co	20— 2
ad o k	13|7065360— 4
Quo addito ad i o	120|5598000
fit i k	134|2663

Linea h S est linea i k minus linea a k quæ sic invenitur.

Ut Sα radius	10000000
ad αk tangentem	4071228
Ita Sα	200
ad αk	81|4245|600
Quo dempto de i k	134|2663|
Restat hS	52|8417|



Linea S a eſt linea RT minus RV. plus b a, quæ duæ lineæ ſic inveniuntur.

In triangulo R S V

Ut SV radius		10000000
ad VR tangentem		4071228
Ita SV		20
ad VR	8	1424560
Quo demto de RT	691	256292
Remanet VT vel Sb	683	113836

In trian-

In triangulo T b a

Ut T b radius	10000000
ad b a tangentem	11054284
Ita T b	20
ad b a	22 | 1085680
Quo addito ad S b	683 | 113836
Fit S a	705 | 222404

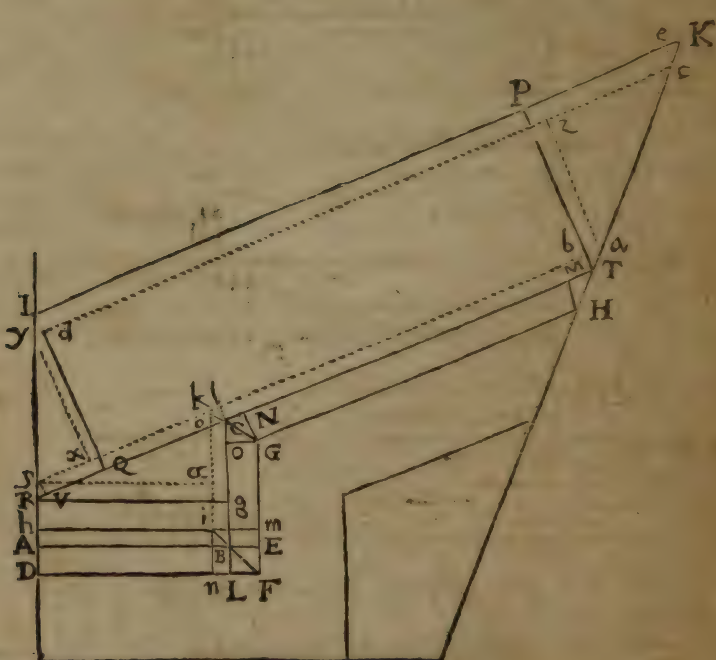
Linea Y c eſt linea IK plus vel minus ek, quæ duæ lineæ ſunt æquales lineis R V & ba per ſtructuram.

Atqui linea IK eſt	830 | 9174
Hinc ergo ſubtrahe eK vel ba	22 | 1086
Et reſtabit le vel d c	808 | 8088
Cui adde y d vel R V	8 | 1425
Et habebis y c	816 | 9513

Iam ad areas ſive ſuperficies

In oblongo S y c a longitudo maxima y c eſt	816 | 9513
minima S a	705 | 2224
	1522 | 1737
media	761 | 0868
latitudo y x	160
	45665 | 2080
	76108 | 68
Area S y c a	121773 | 8880
In trapezio i h S k longitudo maxima i k	134 | 2663
minima S h	52 | 8417
	187 | 1080
media	93 | 554
latitudo h i	200
Area trapezii i h S k	18710 | 800
Area oblongi S y c a	121773 | 888
Summa arearum	140484 | 688
profunditas foſſæ	20
Capacitas perpendicularis	2809693 | 760

Acclivitatum longitudo	hi	200	
	io	120	5598
	lb	453	7226
	cd	808	8088
		1583	0912
dimidium		791	5456
profunditas			20
Capacitas		158309120	



Pyramidis

Pyramidis BI longitudo	20	
latitudo	20	
plana basis	400	
altitudo	20	
prisma	8000	
pyramis	2666	66666

Pyramidis c o k l longitudo o k	13	7065
latitudo o c	20	
plana basis	274	1300
altitudo	20	
prisma	5482	6000
triens	1827	5333
duplex pyramis	3655	0666

Pyramidis T b a longitudo b a	22	108568
latitudo dimidia	10	
plana basis	221	085680
altitudo	20	
prisma	4421	713600
triens pro pyramide eck	1473	904533
duplex pyramis pro Tba	2947	809066

Pyramidis y I d longitudo y d	8	1424
latitudo dimidia	10	
plana basis	81	4240
altitudo	20	
prisma	1628	4800
triens	542	8266
duplex pyramis	1085	6532

Collectio in unam summam.

Capacitas perpendicularis	2809693	760
Capacitas acclivitatum	15830	912

Capacitas

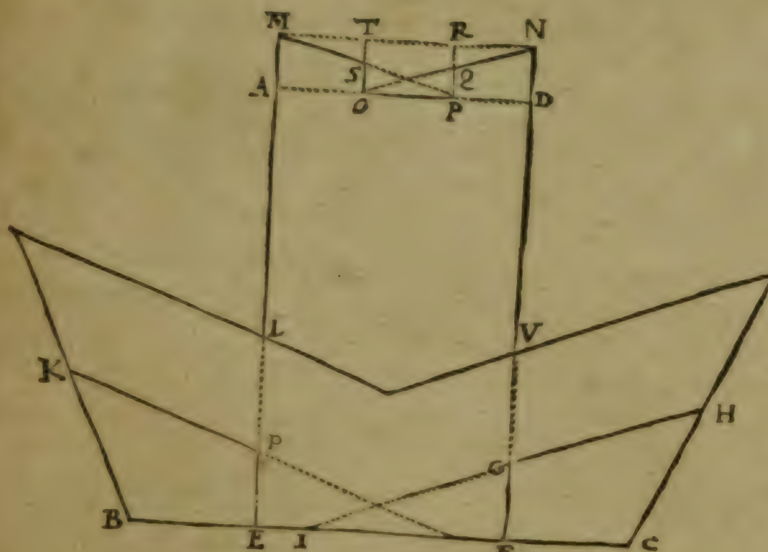
Capacitas pyramidum	2666|667
	3655|067
	1473|904
	2947|809
	1085|653
Capacitas totius fossæ 14.ta parte circuitus.	2837353|772 pro
Atqui valli corpus erat	1261180|873
Superest igitur terra	1576172|899 pedum

cubicorum, quam terram vel ad loricam horizontalem & ad viam quam vocant coopertam adhibebis, vel fossam minorem facies.

PRO-

PROBLEMA XVI.

In opere, quod vocant, cornuto: datâ alâ, & cuſpidum diſtantiâ, cortinam faciebus æqualem conſtituere; & angulos in tali conſtitutione exiſtentes, invenire.



Sit opus cornutum, ſive præmunitio ultra foſſam exiſtens LMNV. lineis PM & GN lineæ defenſionis IH æqualibus: & ſit in eo data ala PQ. 50. pedum, unà cum diſtantia cuſpidum M & N. quæ diſtantia ſemper æqualis eſſe debet cortinæ arcis EF. Quam cortinam in noſtro exemplo jam ſupra poſuimus 500. pedum. Quæratur autem, ſi illæ tres lineæ, MS, OP, & QN. æquales eſſe debeant, quanta unaquæque futura ſit? & quales angulos effecturæ ſint? De quantitate linearum prima cura eſto. Quia igitur MN eſt 500. pedum, OP erit aliquanto

major quam triens 500. pedum. Atqui triens 500. pedum eſt $166\frac{2}{3}$. Ergo OP. erit major quam $166\frac{2}{3}$. pedum. Sit igitur primò 170. pedũ, & ex ea poſitione inquiratur recta MN. hoc modo.

In triangulo OPQ.

Ut OP pedum	170
ad PQ pedum	50
Ita OP radius	10000000
ad PQ tangentem	2941176

Cujus tangentis angulus eſt 16. gr. 23′. 22″.

Cujus anguli ſinus eſt 2821647
Sin⁹ vero cõplementi eſt 9593659

```
50000000|0
17      |0
3.4  (2
160
 17  (9
15.3
 70  (4
 17
 6.8
 20
 1.7  (1
 30
 1.7  (1
 130
  17  (7
 11.9
 110
  17  (6—3 X 8
 102        5
   8

2941176
2939999—16. gr. 23′.
 11770
   527  (22″
  1054
  1230
   527
```

Pergo igitur ad triangulum QRN. quod triangulo OPQ prorſus eſt æquiangulum, per ſtructuram; & dico.

Ut QN radius	10000000	
ad NR ſinum	9593659	
Ita QN pedum	170	
ad NR pedum	163	0922
Cui æquatur MT	163	0922
Quibus addatur TR	170	0000
Fit MN	496	1844
At debebat eſſe	500	
Ergo eſt Minus	3	8156

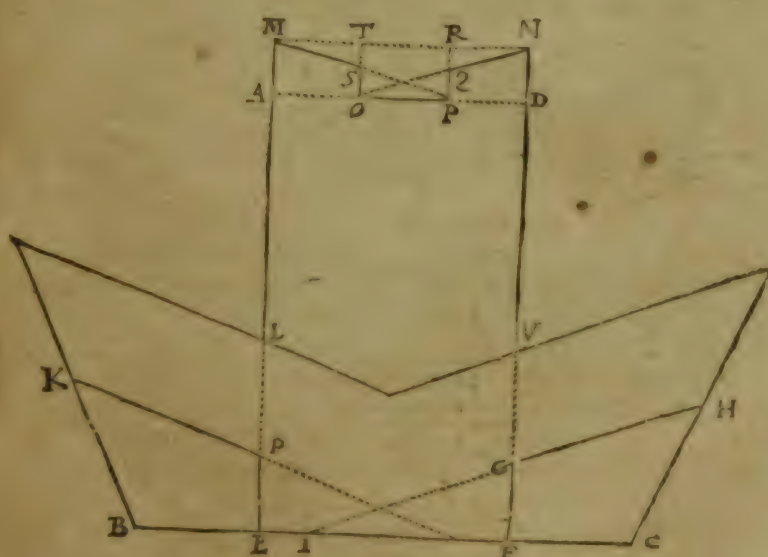
```
  9593659
      170
671556130
 9593659
163|0922030
```

Sit de-

Sit deinde OP. 200. pedum, & per eam quæratur MN, ut ante: nempe hoc modo.

In triangulo OPQ.

Ut OP pedum	200	5000000|00
ad PQ pedum	50	2 |00
Ita OP radius	10000000	
ad PQ tangentem	2500000	2500000
Cujus tangentis angulus est 14. gr. 2'. 10''.		2499460—14.gr.2'.
		5400
Cujus anguli sinus est	2425334	51.5 (10''
Sinus verò cõplementi est	9701431	250



Dico igitur in triangulo QRN.

Ut QN radius	10000000
ad NR ſinum	9701431
Ita QN pedum	200
ad NR pedum	194|0286200
Cui addo MT	194|02862
& TR	200|
Et fit	588|05724
At debebat eſſe	500|
Eſt ergo Plus	88|05724
Hoc multiplica per poſitionẽ primam	170
	616400680
	8805724
Productum primum	14969|73080
Deinde Minus	3|8156
Multiplica per poſ.2. nempe per	200
Productum ſecundum	763|12|00
Productum primum	14969|73| Adde:
Dividendus	15732|85

Plus	88|0572
Minus	3|8156 Adde.
Diviſor	91|8728

15732|85
.91|8.7 (171|25. Latus OP vel QN vel MS quæſitum.

65458
918.7
6430.9

11495
918.7

23080
9187
1.8 37.4

47060
9187
4593.5

1125

0
4
7 X 7
4

Porrò

Porrò, ut OP pedum	171	25		
ad PQ pedum	50		500 | 000000	
Ita OP radius	10000000		171 | 25	
ad PQ tangentem	2919708		34250 (2	
Cujus tangentis angulus est			157500	
16. gr. 16'. 34''½.			17125 (9	
Cujus anguli sinus est	2082688		154125	
Sinus verò complementi est	9599210			
Dico igitur.			33750 (1	
I. Ut QN radius	10000000		17125	
ad QR sinum	2082688		166250 (9	
Ita QN pedum	171	25	154125	
ad QR pedum	35	666	121250	
Cui addo PQ	50		17125 (70	
Et fit PR sive DN	85	666	119875	
II. Ut QN radius	10000000		137500	5
				0
ad NR sinum	9599210		17125 (8	— 0 X 7
Ita QN pedum	171	25	137000	5
ad NR pedum	164	38	500	
Cui addo MT	164	38		
Et TR	171	25		
Efficiturq; MN	500			

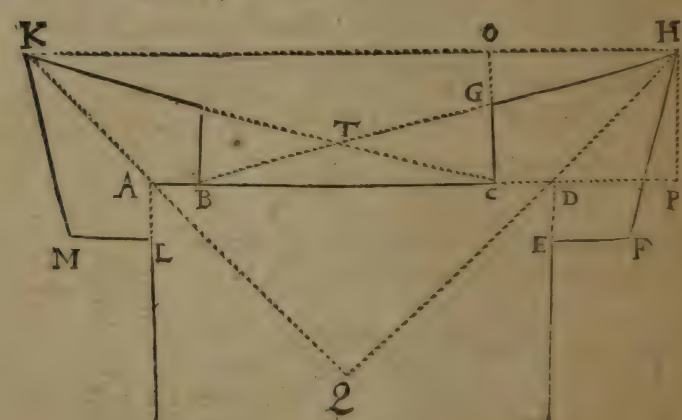
Ab angulo autem recto RND	90. gr.
Si subtraxero angulum RNQ	16. gr. 16'. 34''½.
Remanet angulus QND	73. gr. 43. 25½.
Qui idem est angulus RQN & OQP	
Quo subtracto de duobus rectis	180. gr. 0. 0.
Remanet angulus NQP	106. gr. 16. 34½.
Cujus excessus supra rectum est	16. gr. 16. 34½.

Quibus omnibus sic in chartâ inventis facile erit in campo lineas fossoribus scitu necessarias designare.

PROBLEMA XVII.

Data circumferentia castri, circa cortinas & propugnacula, quantitatem cortinæ, facierum & alarum, ad datam proportionem, & ad angulos unicuiq; multangulo secundùm problema tertium convenientes, invenire.

Castrum voco munitiunculam campestrem: quam Germani vocant, eine Schantze. Cujusmodi munitio pro ratione præsidii vel parva vel magna esse debet: & plerumque ad quadrangularem arçis regularis formam accommodatur.



Sit ergo exstruendum castrum quadrangulare, quod in ambitu habeat ducentas duodecempedas, hoc est pedes 2400 pedes: & sit servanda proportio inter cortinam, facies, & alas,

& alas, talis; ut qualium partium cortina erit 15. talium facies sit 10, ala 4. angulus vero propugnaculi sit 60. gr. per Problema tertium; & linea defensionis ex concursu cortinæ & alæ procedat.

Ambitus totius castri debet esse 200. duodecempedarum.

Hunc ambitum divide per 4. hoc modo: 44(50.

Quotus, hoc est, quarta pars ambitus erit. 50.

Iam collige in unam summam numeros quartæ partis totius ambitus per datam proportionem datos, nempe,

10. facies una	KI
4. ala una.	IB
15 cortina.	BC
4. ala altera.	CG
10. facies altera.	GH
43. Summa.	

Deinde dic 43. dant. pro cortina. 15.
pro faciè. 10.
pro ala. 4.
quid dant 50. pro cortina?
pro ala?
pro faciè?

Praxis.

I. Ut 43. ad 15. ita 50. ad $17\frac{19}{43}$.

$$\begin{array}{r} 50 \\ \hline 750 \\ 43 \quad (17\frac{19}{43} \\ \hline 320 \\ 43 \\ 301 \\ \hline 19 \end{array}$$

II. Ut

II. Ut 43. ad 10. ita 50 ad $11\frac{27}{43}$

$$\begin{array}{r} 10 \\ \hline 500 \\ 43 \;(11\frac{27}{43} \\ \hline 70 \\ 43 \\ \hline 27 \end{array}$$

III. Ut 43. ad 4. ita 50 ad $4\frac{28}{43}$

$$\begin{array}{r} 4 \\ \hline 200 \\ 43 \;(4\frac{28}{43} \\ 172 \\ \hline 28 \end{array}$$

Collectio in unam summam.

	Integra.	Partes quadragesimæ tertiæ.
facies una	11.	27
ala una	4.	28
cortina	17.	19
ala altera	4.	28
facies altera	11.	27
Summa	50.	$\cancel{1}\cancel{2}9$ 43. (3

Quod si lineam CD. præterea nosse cupis, primum investiga lineas GO & OH, in triangulo GOH: item lineam DP. in triangulo DHP: deinde lineam DP subtrahe à linea CP. vel OH; & restabit linea CD: juxta processum calculi, Problemate tertio ostensum.

In triangulo GOH. angulus GHO est 15. gr. æqualis nempe angulo GBC, per structuram: atq; adeo angulus OGH est 75. gr. per 49. p. 1.

Porrò,

Porrò, anguli 15. gr. ſinus eſt: 2588190.
anguli 75. gr. ſinus eſt. 9659258.

Dico igitur:

I.	Ut GH. radius	10000000
	ad GO ſinum	2588190
	Ita GH. partium	10
	ad GO. partium	2|58819
	Cui ſi addatur GC	4|
	Efficitur OC vel HP	6|58819
II.	Ut GH. radius	10000000
	ad OH ſinum	9659258
	Ita GH partium	10|
	ad OH vel CP partium	9|659258

Denique, in Triangulo DHP. quia anguli DHP & HDP ſunt æquales: quippe uterq; dimidius recti, per ſtructuram: ideo etiam latera ipſis oppoſita DP & HP ſunt æqualia. Ergo

De recta CP	9|659258
ſubtraho rectam DP	6|588190
Et reſtat recta CD	3|071068. hoc eſt $3\frac{7}{100}$ vel $3\frac{1}{14}$.

Quod oſtendendum erat.

PROBLEMA XVIII.

Circa aggerem definitæ longitudinis, latitudinis & altitudinis, foſſæ parallelæ & tantundem terræ continentis latitudinem ad datam profunditatem invenire.

In planicie ABCD. longa 250. lata 110. ped. ſit congerendus agger, cujus ima ſuperficies EFGH. ſit longa 240. lata 100. ped. ſumma ſuperficies IKLM. ſit longa 200. lata 60.

n ped.

ped. adeoque acclivitas undique ſit 20. ped. altitudo perpendicularis itidem 20.ped. ſpatium inter aggerem & foſſam 5. ped. Foſſam autem ſcaturigines vel ſaxa non ſinant profundiorem facere quàm quinque pedum. Quæritur quàm lata foſſa eſſe debeat, ut ſufficientem aggeri congerendo terram ſuppeditet. Initio aggeris quantitas inveſtigetur hoc modo.

Supremæ ſuperficiei longitudo IK		200
	latitudo KL	60
	ſuperficies	12000
	altitudo	20
	corpus perpendiculare	240000
Acclivitatum longitudo dimidia IK		200
	KL	60
		260
	latitudo	20

plana

	plana basis	5200
	altitudo	20
	corpus	104000
Pyramidum angularium longitudo		20
	latitudo	20
	plana basis	400
	altitudo	20
	prisma	8000
	Quater sumtum	32000
	Ejus triens	$10666\frac{2}{3}$.
	huic adde	104000
	Item	240000
	& habebis totum corpus	$354666\frac{2}{3}$.

Quod divisum per datam profunditatem fossæ nempe per 5. patefaciet aream sive superficiem fossæ perpendicularis hoc modo.

$$354666\tfrac{2}{3}\ (70933\tfrac{1}{3}.$$
$$5\ \ 555$$

Quæ superficies $70933\frac{1}{3}$. divisa per longitudinem, latitudinem prodere debebat. At neutra nota est. Quæritur igitur imprimis latitudo.

Modus inveniendi triplex est.

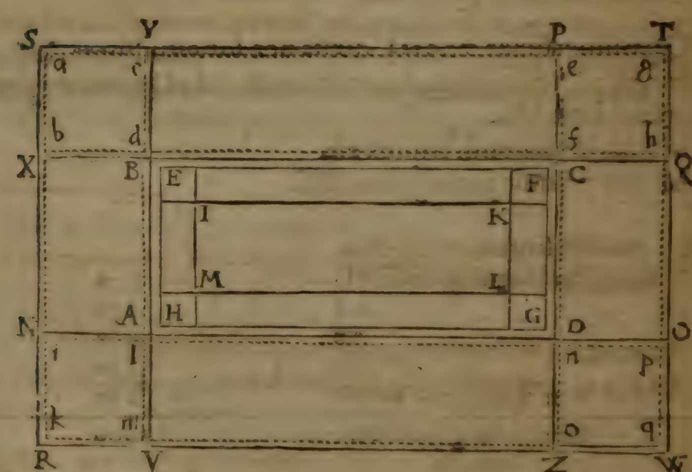
Modus primus per regulam falsi.

I. Ponatur latitudo 70. pedum.

Erit igitur longitudo fossæ BC	250
AD	250
AB	110
CD	110
Item quater 70. hoc est	280
summa longitudinum	1000
latitudo	70

ſuperficies inventa	70000
At debebat eſſe	$70933\frac{1}{3}$
Eſt ergo minus	$933\frac{1}{3}$.

II.	Ponatur latitudo	71 ped.	Hæc multipli-
	longitudo igitur erit	1004 ped.	centur invicem.
		1004	
		7028	
	ſuperficies	71284	
	At debebat eſſe	$70933\frac{1}{3}$.	
	Eſt ergo plus	$350\frac{2}{3}$.	
	minus	$933\frac{1}{3}$.	Adde.
	diviſor	1284	~~22~~
	plus	$350\frac{2}{3}$.	~~440~~ (46
	poſitio minor	70 Multiplica.	~~55~~



	24500	
	$46\frac{2}{3}$.	
	$24546\frac{2}{3}$.	~~5~~2
minus	$933\frac{1}{3}$.	~~7~~~~1~~ (23
	71 Multiplica.	3~~3~~
	933	
	65310	
	$23\frac{2}{3}$.	
	$66266\frac{2}{3}$.	
adde	$24546\frac{2}{3}$.	
fit dividendus	$90813\frac{1}{3}$.	
Divisor	1284 (70 $\frac{933\frac{1}{3}}{1284}$ latitudo	
	8988 fossæ quæsita.	
	$933\frac{1}{3}$.	

Secundus modus per Algebram.

Latitudo quæsita CP. sit i. l.

ergo ejus quadratum erit i. q. horum autem sunt quatuor in proposita figura

Deinde longitudines	250
	250
	110
	110
	720
multiplicentur per	i l.
& fiet area oblongi	720 l.

Cui areæ adde aream quatuor quadratorum
Et erit tota area sive superficies fossæ.

4q. + 720 l. æqualis $70933\frac{1}{3}$.

Ergo: 1 q. + 180 l. æqualis $17733\frac{1}{3}$.

Et per consequens 1 q. æquatur $17733\frac{1}{3}$. — 180 l.

dimid. — 90

— 90

Quadratum + 8100

+ $17733\frac{1}{3}$.

Quadratum $25833\frac{1}{3}$ (radix 160|72751

1 90|

158 70|72751

26 latitudo fossæ

156 quæsita.

23333

3207

22449

88433

32142

64284

2414933

324447

2250129

16480433

3214545

16072725

407708

Tertius modus ab Illustrissimo Principe Anhaltino mihi ostensus talis est.

Planiciei ABCD longitudo	250
latitudo	110
	2500
	25

longitudo	250
latitudo	110
differentia	140
dimidium	70
Quadratum	4900

ipsa

ipsa planicies sive area ABCD	27500
Area fossæ circum jacens	$70933\frac{1}{3}$.
Area tota RSTV	$98433\frac{1}{3}$.
adde quadratum	4900

Fit aliud quadratum

$103333\frac{1}{3}$
3
9 (3
133
62 (2
124
933 (1
641
29233 (4—1
6424
25696

(radix 321	4551	
70	adde & subtrahe.	
391	4551	latus majus ST.
251	4551	latus minus RS.
110		Subtrahe.
141	4551	Divide per 2.
70	7275	latitudo fossæ quæsita.

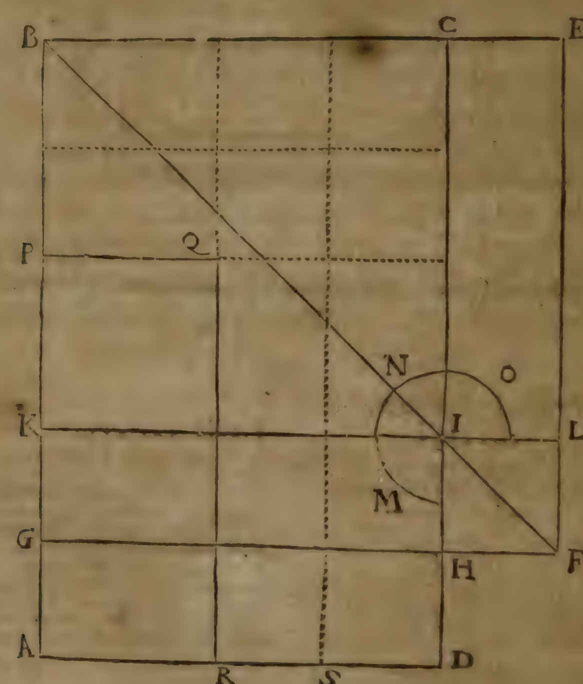
353.

353733
64285 (5—6
321425

3230833 9
642905 (5—2 X 2
3214525 4

16308.

Demonſtratio hujuſmodi, omnium ingenioſiſſimi, pendet à ſexta propoſitione 2. lib. Euclid. vel à 44. propoſitione 1. lib.



Trigo-

Trigonometriæ nostræ. quæ propositio ita habet, *Si recta bisecta continuetur, oblongum continuatæ & continuationis est æquale quadrato rectæ ex bisegmento & continuatione compositæ: minus quadrato bisegmenti.* Ad cujus propositionis exigentiam oblongum quod prius erat ABCD. nunc sit APQR, nempe ex medio figuræ ad extremitates ejus translatum. De latere AP. auferatur latus PQ, vel illi æquale PK, ut restet AK. cujus dimidium sit AG. vel GK. Erit igitur AK. recta bisecta in G. quæ, si continuetur à K in B. & ex continuata AB atque continuatione KB. vel BC. fiat oblongum ABCD. Dico hoc oblongum ABCD. æquale esse quadrato rectæ ex bisegmento GK. & cõtinuatione KB compositæ. nempe quadrato GBEF. minus quadrato bisegmenti HILF. Ergo si ad oblongum ABCD. hoc est ad gnomonem MNO. addatur quadratum HILF. habebitur quadratum FGBE. ad cujus radicem GB. si addam AG fit AB latus majus oblongi ABCD. vel, de cujus radice BE. si auferam CE. relinquitur BC. latus minus oblongi ABCD. A cujus æquipollente AD. si auferam AR relinquitur RD. Cujus dimidium RS est latitudo fossæ quæsita.

Per numeros si has inventiones examinare libeat, ita fac.

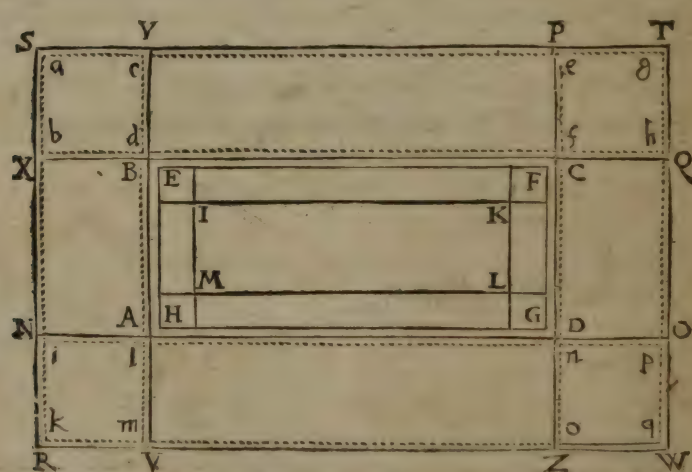
latitudo inventa	70	7275
multiplicetur per		4
addatur	282	9100
ad longitudines reliquas	250	
	250	
	110	
	110	
& habebitur tota longitudo	1002	9100
Quæ multiplicata per latitudinem	70	7275

o 5014-

		5014	5500
	7	0203	700
	20	0582	00
	702	0370	0
	70203	700	
redder aream fossæ priorem	70933	3169	25
quæ multiplicata per altitudinem		5	
Reddit corpus	354666	5845	
aggeris ut pri-		6666	
dem: præter		821	

$\frac{821}{10000}$. unius pedis: quæ differentia pro nihilo reputanda est, & evitari etiam potuisset: si fractiones majores ad calculum assumtæ fuissent.

Cæterùm hæc capacitas fossæ tota est perpendicularis. At talis revera fieri fodiendo non potest: sed quanta est ejus pro-



funditas,

ſunditas, tanta etiam eſſe debet acclivitas. Quæritur igitur: ſi foſſa ſupernè quinque pedibus fiat latior, infernè reſtrictior, an tantundem terræ ſit præbitura? Reſpondetur quod non. Et eſt cauſa manifeſta. Nam acclivitatibus quidem AB, BC, CD, DA, è regione reſpondent acclivitates NX, YP, QO, VZ. Item acclivitatibus angularibus exterioribus interiores reſpondent, & ſimul priſma complent, verbi gratia acclivitas angularis ad S & B. ſimul priſma complent. At acclivitatibus exterioribus XS, SY, PT, TQ, OW, WZ, VR, RN. nihil eſt quod in interiore ambitu reſpondeat. Itaq; hæ acclivitates abundabunt, quod ipſe etiam calculus coarguet.

Sint enim capacitatis perpendicularis

longitudines	260	
	260	
	120	
	120	
	65	7275
	65	7275
	65	7275
	65	7275
longitudo tota	1022	9100
latitudo	65	7275
	5114	5500
	71603	7
	204582	
	716037	
	511455	
	613746	

Acclivitatum.

longitudo	250	
	110	
	391	4551
	251	4551
longitudo	1002	9102
latitudo		5
baſis	5014	5510
altitudo		5
corpus	25072	7550

Pyramidum.

plana baſis	25
altitudo	5
	125
multiplicetur per	4
	500

ſuperficies	67233	3170	2500
	altitudo		5
Capacitas	336166	5851	25
	25072	755	
	500		
Tota capacitas fit	361739	340	
Ad debebat eſſe	354666	333	
differentia eſt	7073	007	

Quæ differentia ex dictis acclivitatibus exterioris ambitus, quibus nullæ in interiori ambitu reſpondent, reſultat: ut porrò calculus oſtendet. Sit enim earum acclivitatum (quarum ſunt octo.)

ſingularum longitudo	70	7275
multiplicetur per		4
longitudo univerſarum dimidia erit	282	9100
& latitudo		5
plana baſis	1414	55
altitudo		5
Capacitas	7072	75

Igitur ne tantus error committatur, alia ratio latitudinis foſſæ ineunda eſt, talis nimirum.

Ad calculum aſſumatur initium non ſupremæ ſed mediæ latitudinis foſſæ: & omnia rectè procedent, ut ex ſubjectis numeris apparet

per modum primum.

I.	Ponatur latitudo e f	70 pedum.
	ea quater ſumta	280
	addatur ad reliquas	
	longitudines d f	255
	l n	255
	d l	115
	f n	115

Summa

Summa longitudinum erit	1020
latitudo ef	70
ſuperficies erit	71400
at debebat eſſe	$70933\frac{1}{3}$
Ergo eſt plus	$466\frac{2}{3}$.

II. Ponatur latitudo eF 69 pedum.

multiplicetur per	4
addantur reliquæ longitudines	276
	255
	255
	115
	115
ſumma longitudinum	1016
latitudo	69
	9144
	6096
ſuperficies eſt	70104
at debebat eſſe	$70933\frac{1}{3}$
eſt ergo minus	$820\frac{1}{3}$
adde plus	$466\frac{2}{3}$
fit diviſor	1296
Plus	$466\frac{2}{3}$
per poſitionem minorem	69
	4194
	27960
	23
	23
	32200
Minus	$829\frac{1}{3}$
per poſitionem majorem	70

	58030	
	$23\frac{1}{3}$	
	$58053\frac{1}{3}$	
adde	32200	
fit dividendus	$90253\frac{1}{3}$	
diivsor	1296	
	7776	$(69\frac{829\frac{1}{3}}{1296}$ latitudo quæsita.
	12493	
	1296	
	11664	
residuum	$829\frac{1}{3}$	

Per modum Secundum.

longitudo	255	latitudo quæsita sit i l.
multiplicetur per	i l.	ergo ejus area quater
fit	255 l.	sumta erit 4. q.
& sic deinceps	255 l.	
	155 l.	
	155 l.	

ergo 4 q.	+	740 l.	æquales		$70933\frac{1}{3}$
1 q.	+	185 l.	æquales		$17733\frac{1}{3}$
1 q.	æquales	$17733\frac{1}{3}$	—		185 l
			—		$92\frac{1}{2}$
			—		$92\frac{1}{2}$
					184
					8280
					$92\frac{1}{4}$
				+	$8556\frac{1}{4}$
				+	$17733\frac{1}{3}$
					$26289\frac{7}{12}$

12 — 100000 — 7
700000 (58333
12
60
100
12
96
40
12
36
40

$16289\frac{7}{12}$
1
162 (1
26 (6
156
689
322 (2 — 0 X 0
644
45|58 (1
3241
131733 (4
32424
129696
20373333
3242806 (6
19456836
916497

(162|1406
92|50
$69|\frac{6406}{10000}$
latitudo foſſæ media.

Per modum Tertium.

longitudo	255
latitudo	115
differentia	140
	70
	70
Quadratum	4900

longitudo	255 — 3
latitudo	115 — 7
	1275
	255
	255
ſuperficies	29325 — 2

ſuperficies pedis aggeris uſq; ad initium mediæ latitudinis foſſe	29325
ſuperficies foſſæ	$70933\frac{1}{3}$

Qua-

Quadratum	105158 $\frac{1}{3}$	radix	324 | 8212
	3		70 |
	9		394 | 2812
	151		255 |
	62		139 | 2812
	124	latitudo media	69 | 6406
	2758.		5 | Adde & ſubtr.
	644		74 | 6406 latitudo ſuprema.
	2576		
	18233		64 | 6406 latitudo infima.
	6482 (2		
	12964		
	526933 (8		
	64848		
	518784 (1		
	814933		
	648561		
	166372 (2		

Iam per inventam triplici modo latitudinē mediam ſuperficies & inde capacitas foſſæ inquiratur hoc modo.

latitudo foſſæ media	69	6406	
		per 4	
effecta inde longitudo	278	5624	
reliqua longitudo	740		
longitudo media	1018	5624—0	
latitudo media	69	6406	
	6111	3744	
	40 | 7424	96	
	611 | 1374	4	
	9167 | 0616		
	61113 | 744		
ſuperficies	70933 | 2966	7344—0	
altitudo	5		
Capacitas foſſæ	354666 | 4830		

Vides

Vides, hunc calculum veritati exactiſſimè reſpondere, quam veritatem etiam ſequens calculus ex latitudine non media, ſed maxima & minima inſtitutus, comprobabit hoc modo.

longitudines minimæ	260	
	260	
	120	
	120	
	258	5624
aggregatum	1018	5624—0
latitudo minima	64	6406—8

64	6406—8	
	4—4	
258	5624—5	

	6111	3744	
40	7424	96	
611	1374	4	
4074	2496		
61113	744		
65840	4846	7344—0	
altitudo		5	
Capacitas perpẽdicularis 329202	4234		

Pyramidum

longitudo	5
latitudo	5
plana baſis	25
altitudo	5
	125
multiplicetur per	4
Capacitas tota octo pyramidum	500

Acclivitatum

longitudo	250	
	110	
	389	2812
	249	2812
	998	5624
latitudo		5
	4992	8120
altitudo		5
Capacitas acclivitatum	24964	0600

Capacitas perpendicularis	329202	4234
Capacitas acclivitatum	24964	0600
Capacitas pyramidum	500	
Capacitas tota	354666	4834

Cur autem in tali fossa, quæ circa aggerem oblongum æquidistanter ducta sit, calculus per mediam latitudinem & longitudinem institutus recte procedat: in aggere verò ipso, vel etiam in aliis fossis circa totam aliquam arcem ductis non item: ejus rei causam in intimis Geometriæ penetralibus absconditam hoc loco proferre nolo: ne nihil reliquisse videar aliorum industriæ.

BAR-

BARTHOLOMÆI PITISCI
Grunbergensis

PROBLEMATUM
GEOGRAPHICORUM

Liber Unus.

PRÆFATIO.

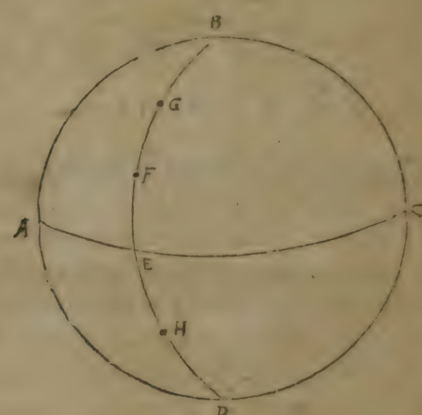
AD Geographiam pertinet doctrina de supputandis distantiis locorum: ex data ipsorum longitudine & latitudine. Est autem longitudo loci nihil aliud, quàm distantia meridiani per illum locum transeuntis, à meridiano primo, qui statuitur in insulis fortunatis: & numeratur illa distantia in æquatore: ab occasu per meridiem versus ortum. Latitudo loci, nihil est aliud, quàm distantia verticis loci, ab æquatore versus meridiem, aut septentrionem: & numeratur in meridiano per loci propositi verticem transeunte: ac semper convenit cum elevatione poli, supra horizontem illius loci. Cæterum, supputantur quidem distantiæ locorum etiam per penult. primi Euclid. sive per 50. p. primi nostri, hoc est, per Triangula plana: at quia superficies terræ non est plana, sed rotunda: rectius supputantur per Triangula Sphærica. In quibus notandum: singulis gradibus circulorum maximorum, circa globum terræ ductorum respondere milliaria Germanica 15. Quod, vel inde patet: quia si 15. milliaribus propius ad Septentrionem accedas, polum septentrionalem uno gradu altius, quàm antè, supra horizontem elevatum esse deprehendes.

PROBLEMA PRIMUM.

Datis duobus locis sola latitudine differentibus, eorum distantiam invenire.

CASUS PRIMUS.

Si utriusque loci latitudo sit versus eundem polum: ut est locorum F & G.



REGULA. Subtrahe latitudinem minorem EF, à majore EG, differentiam FG, quæ post subtractionem restabit, converte in milliaria: & negocium confectum erit.

EXEMPLUM. Basilea Rauracorum & Friburgum Brisgoiæ, longitudinem habent eandem nempe 27. gr. 45. m. & sita sunt versus eundem polum: nempe septentrionalem. Sed latitudine differunt. Et Basileæ quidem latitudo est 47. grad. 30'. velut EF, Friburgi verò latitudo est 48. gr. 13'. velut EG.

Primum

Primum igitur ab	EG, 48. gr. 13'.
Subtraho	EF, 47. 40.
Et restat	FG, 0. gr. 33. m.

Deinde dico:

1. gr. dat 15. milliaria, quid dant 33. m.
60. m.

15.
165.
33.
495.
60. (Rc. 8¼. milliaria.

CASUS SECUNDUS.

Si alterius loci latitudo sit septentrionalis, alterius meridionalis: ut est locorum H & G.

REGULA. Adde latitudinem utranq;: & summam in milliaria converte hoc modo.

EXEMPLUM. Bellogradum in Europa (Griechisch Weissenburg) & Caput bonæ spei in Africa, habent eandem longitudinem, nempe 48. gr. 30. m. Sed latitudinem, illud quidem septentrionalem, tanquam EG, 44. gr. 30'. Hoc verò meridionalem tanquam EH, 35. 30.

Additis igitur EG, 44. 30.
& EH, 35. 30.

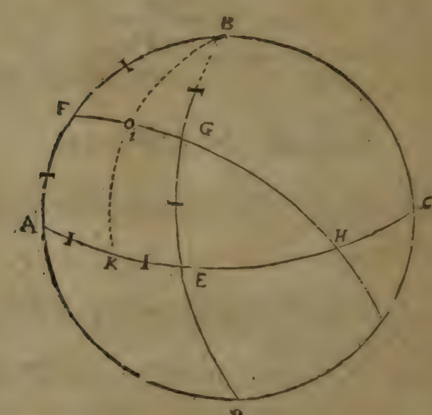
Diço 1. gr. dat 15. milliaria: quot milliaria dant 80. grad.
Rc. 1200.

PROBLEMA SECUNDUM.

Datis duobus locis sola longitudine differentibus, eorum distantiam invenire.

CASUS PRIMUS.

Si uterque locus situs sit sub æquatore, Vt A & E.



REGULA. Subtracta longitudine minore à majore, differentiam converte in milliaria, & habebis distantiã quæsitam.
EXEMPLUM. Insula S. Thomæ in Africa, sub Æquatore sita, longitudinem habet 32. gr. 20. m. Insula Sumatra prope Indias orientales, sub eodem Æquatore sita, longitudinem habet 131.

Igitur à 131. gradibus.
Subtraho—32. gr. 20. m.

Et restat differentia 98. gr. 40. m.

Tum

Tum dico:

1. gr. dat 15. milliaria: quid dant 98. gr. 40.m.

℞. 1480. milliaria.

Tanta eſt diſtantia inter iſtas duas inſulas: ſi utriuſq; inſulæ medium & quaſi centrum ſpectes.

CASUS SECUNDUS.

Si uterq; locus ſitus ſit extra Æquatorem.

REGULA. Hic ſolvendum eſt Triangulum æquicrurum FBG, in quo crura æqualia FB & BG, ſunt complementa latitudinum æqualium AF & EG. Angulus FBG, eſt differentia longitudinis. Qui angulus, ſive ſit rectus, ſive obliquus, Triangulum FBG, facilimè ſolvitur, ſi dimiſſo à B, in I, perpendiculo BI, in duo Triangula FBI, & IBG, dislocetur. Quia enim duo illa Triangula erunt æqualia: per 23.p.1. ideo invento arcu IG, in Triangulo IBG, etiam arcus FI, in Triangulo FBI, inventus erit.

Dico igitur per axioma tertium.

Ut BIG, rectus ad BG, complementum latitudinis:
Ita IBG, dimidia differentia longitudinis,
ad IG, dimidiam diſtantiam.

Vel.

Continuato perpendiculo BI, in K, ut ſit quadrans BK, quia Triangulum IHK, angulos ad I & K, habet rectos: ad I, per theſin, ad K, per 57.p.1. ac proinde latera IH, & KH, ſunt quadrantes: per 68 p.1. Et denique arcus GH & EH, arcuum IG & KE, complementa per 9. p. 1. Ideo in Triangulo GEH, rectangulo ad E, per 57.p.1. inquiro complementum tertii lateris GH, nempe arcum GI, per axioma quartum.

EXEM-

EXEMPLUM. Noriberga & Amberga propemodum eandem latitudinem habent, nempe Noriberga 49. grad. 22. m. Amberga 49. gr. 24. m. Hoc eſt, uterq; locus habet latitudinem circiter 49. gr. 23. m. Longitudine autem differunt. Nam longitudo Noribergæ eſt 31. gr. 45. m. Ambergæ 32. gr. 30. m. Differentia longitudinis eſt o. gr. 45. m.

Sit ergo Noriberga F, Amberga G, ac proinde AF, vel EG, 49. gr. 23'. FB vel GB, 40. 37. FBG, ſive AE, o. gr. 45. m. KE, o. gr. 22½. m. EH, 89. gr. 37½. min.

Per axioma tertium calculus talis erit.

Ut BIG, 90. gr. ad BG, 40. gr. 37'.	ita IBG, o. gr. 22½.	
100000.	65099.	654.
	654.	
	260396.	
	325495.	
	390594.	
ad 425 ſinum arcus	74746.	

At per axioma quartum calculus talis erit.

GE, 49. 23.	idem 49. 23.		
EH, 89. 37½. Compl.	0. 22½.		
139. 0½.	49. 45'½.	Sinus	76333.
Exc. 49. 0½. Sinus	— — — —		75480.
			853.
			426.

Sinus arcus GI, o. grad. 14'. 40". cujus duplum eſt arcus FG, o. grad. 29'. 20". cui arcui reſpondent milliaria 7⅓.

Nam ut

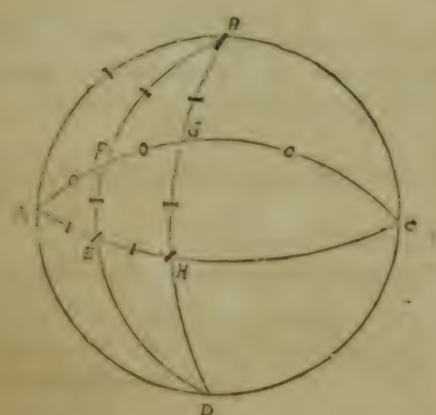
Nam ut 60. min. ad 15. milliaria, ita $29\frac{1}{3}$. minut. ad $7\frac{1}{3}$. mill. Ergo Noriberga & Amberga invicem distant $7\frac{1}{3}$. milliaribus. Vulgò octo milliaria integra numerant.

PROBLEMA TERTIUM.

Datis duobus locis & longitudine & latitudine differentibus, eorum distantiam invenire.

CASUS PRIMUS.

Si alter locus situs sit sub æquatore, alter extra Æquatorem, ut ◡AG, vel ◡AF, vel FC.



REGULA PRIMA. Si differentia longitudinis sit quadranti æqualis: ut est locorum A & G, distantia AG, est quadrans. A enim est polus circuli maximi BGD, per 56. p. 1. Ergo omnes arcus inde ad BGD, ducti sunt quadrantes, per eandem.

EXEMPLUM. Insula Sumatra longitudinem habet 131. gr. latitudinem nullam.

Buda metropolis Hungariæ, longitudinem habet 41. grad. lat. 47. gr.

Differentia longitudinis est 90. gr. Subtractis enim 41. de 131. remanent 90.

Ergo distant inter sese 90. gradibus, hoc est, milliaribus Germanicis 1350. Nam ut 1.—ad 15.—ita 90. ad 1350.

REGULA SECUNDA. Si differentia longitudinis sit quadrante minor: ut est locorum A & F. Solvendum est Triangulum AEF, per axioma quartum: vel illi adjacens FBG, per primum aut tertium.

EXEMPLUM. Insula S. Thomæ longitudinem habet 32. gr. 20'. latitudinem nullam: tanquam si ad A, sit sita. Amsterodamum in Hollandia longitudinem habet 26. gr. 30. m. latitudinem 52. gr. 40. m. tanquam F.

Differentia longitudinis ABF, vel per 58. p. 1. AE, est 5. gr. 50. m.

Distantia quæsita est AF.

Calculus per axioma quartum talis erit.

AE, 5. gr. 50'.		Idem	5. gr. 50'.		
EF, 52.	40.	Compl.	37.	20.	
58.	30.		43.	10.	—68412.
31.	30.	—	—		52250.
					120662.
					60331.

Sinus arcus FG, 35. grad. 41'. cujus complementum est AF, 54. gr. 19'.

Per

Per axioma primum calculus talis erit.

Ut BE, 90. gr. ad EH, 84. 10. ita BF, 37. 20. ad FG.

100000. *99482.* *60645.*

60645.

497410.
397928.
596892.
596892.

60330|85890.

Sinus arcus |

FG, 35. gr. 41. m. cujus compl. est AF, 54. gr. 19. min. cui respondent milliaria Germanica 814$\frac{3}{4}$. Nam

Ut 1. gr. ad 15. mill. ita 54. gr. 19. m.

15.

270. *NB. 4$\frac{3}{4}$. est quarta pars ex 19 sicut 15. est quarta pars è 60.*

54|4$\frac{3}{4}$.

ad 814$\frac{3}{4}$. milliaria.

Per axioma tertium calculus est idem qui per axioma primum.

Nam proportio:

Ut BGF, ad BF, ita GBF ad GF.

Prorsus eosdem numeros gignit, quos proportio:

Ut BE ad EH, ita BF ad FG.

Nisi quod duo termini intermedii sunt transpositi; quæ transpositio in calculo nihil mutat, per 42. p. 5.

REGULA TERTIA. Si differentia longitudinis sit quadrante major: ut est locorum F & C. Solvendum venit Triangulum FCE, rectangulum ad E, sed Triangulum illud latera FC & EC, habet quadrantibus majora. Ergo pro eo solvas Triangulum AEF, Triangulo FEC adjacens, & negocium

confectum erit. Nam per ſolutionem Trianguli AEF, reperies arcum FG, quo addito ad quadrantem GC, conflabitur arcus FC, quæſitus.

EXEMPLUM. Heidelbergæ longitudo eſt 30.gr.45.m.latitudo 49.gr.35′. tanquam quæ ſita ſit ad F. Sumatræ longitudo eſt 131.gr. latitudo nulla, tanquam quæ jam ſit ad C.

Differentia longitudinis eſt 100.gr.15′. EC, ejuſq; complementum AE, 79.gr.45.m.

Calculus per axioma quartum talis erit.

EF,	49.35.	—	—	49.35.		
AE.	79.45.	—	—	10.15.		
	129.20.	—	—	59.50.	—	86456
Exc.	39.20.	—	—	—	—	63383
						23073
						11536

Sinus arcus FG, 6.gr.37′½.m. quo addito ad FC, 90. efficitur arcus 96.gr.37′½.m. cui arcui reſpondent milliaria Germanica 1449 $\frac{5}{16}$.

CASUS SECUNDUS.

Si uterq; locus ſitus ſit extra Æquatorem: Vt FH vel FG, vel FI, vel IK, &c.

REGULA PRIMA. Si uterq; locus ſitus ſit verſus eundem polum: ſemper datur Triangulum congruens ad axioma quartum, ſive angulus ad B, ſit rectus, ſive obliquus. Ut ſi loca data ſint, FG, datur ſolvendum Triangulum FBG, cum acuto ad B. Si loca data ſint F, H, datur ſolvendum Triangulum FBH, cum recto ad H. Si loca data ſint F, I, datur ſolvendum Triangulum FBI, cum obtuſo ad B.

EXEM-

EXEMPLUM PRIMUM. Congruens ad formam Trianguli FBG. acutanguli ad B.

Grünberga prima patria mea longitudinem habet 38. gr. 10. m. latitudinem 52. gr. 2. m.

Heidelberga, altera patria mea, longitudinem habet 30. gr. 45. m. Latitudinem 49. gr. 35. m.

Sit ergo F, Heidelberga. G, Grünberga.

Differentia longitudinis BG, est 7. 25. distantia quæsita FG. Complementum latitudinis minoris AF, 49. gr. 35. m. est FB, 40. gr. 25. m.

Complementum latitudinis majoris LG, 52. grad. 2. m. est BG, 37. grad. 58. m.

Calculus igitur talis erit.

BG,	37.58.	—	37.58.		
FB,	40.25.	—	49.35.		
	78.23.		87.33.	—	99909.
	11.37.	—	—	—	20136.
				93	FBG.

FBG, 7.25. 100000. 79773.
81.35.| 99163. 39886.
837.
Ut 100000. ad 39886. ita 837.
837.
279202.
119658.
319088.
ad—33384582.
quo detracto|
de 99909. relinquitur 99576. sinus arcus GH, 84. grad. 44. m. cujus compl. est 5. gr. 16. m. arcus FG, quæsitus. Cui arcui FG, 5. gr. 16. m. respondent milliaria Germanica 79. m.

EXEMPLUM SECUNDUM. Congruens ad formam Trianguli FBH, rectanguli ad B.

Spiræ longitudo est 28. gr. 45. m. latitudo 49. gr. 20. m. Daroacanæ civitatis Paropanisi, regionis Asiæ, longitudo est 118. gr. 45. m. latitudo 34. gr. 45. m.

Differentia longitudinis 90.

Distantia quæsita FH.

Complementum latitudinis minoris AF, 34. gr. 45. m. est FB, 55. gr. 15. m.

Complementum longitudinis majoris EH, 49. gr. 20. m. est HB, 40. gr. 40. m.

Calculus igitur talis erit.

HB, 40. gr. 40'. — — 40 gr. 40'.
FB, 55. gr. 15'. — — 34. 45.
95. 55. — — 75. 25. — 96778
5. 55. — — — — — 10308
86470
43235. Sinus
Arcus

Arcus 25. gr. 38. m. cujus compl. est arcus FH, 64. gr. 22. m. cui respondent milliaria Germanica 965½.

EXEMPLUM TERTIUM. Congruens ad formam Trianguli FBI, obtusanguli ad B.

Heidelbergæ longitudo est 30 gr. 45. m. lat. 49. 35.

Carticardamnæ in India, ubi S. Thomas Apostolus sepultus esse dicitur, longitudo est 136. gr. 50. m. latitudo 12. gr. 40. m.

Differentia longitudinis est 106. gr. 5. m. tanquam angulus FBI, obtusus.

Distantia quæsita est FI.

Complementum latitudinis minoris AF, 12. gr. 40'. m. est FB, 77. gr. 20'.

Complementum latitudinis majoris IL, 49. gr. 35. m. est IB, 40. gr. 25. m.

Calculus igitur talis erit.

IB, 40.25. — 40.25.
FB, 77.20. — 12.40.
117.45. 53. 5. — 79951.
27.45. — — — 46561.
126512.
63256.

FBI, 106. 5. | 100000.
Exc. 16. 5. 27704.
127704. Sinus versus.
63256. Medietas rectæ.
766224.
638520.
255408.
383112.
766224.
80780 | 44224.

79951.|

829. Sinus arcus o. grad. 28½. min. qui additus ad quadrantem 90. grad. constituit arcum quæsitum FI, 90. grad. 28½. m. Cui arcui respondent milliaria Germanica 1357.

REGULA SECUNDA. Si alter locus situs sit versus polum septentrionalem: alter, versus polum meridionalem: ut G & K. Item H & K, Item I & K, semper datur Triangulum ejusmodi, cujus alterum latus circa angulum datum sit quadrante majus: ut BK. Ergo pro illo latere BK, sumendum est ejus complementum ad semicirculum BF, hoc est, pro Triangulo GBK, solvendum est Triangulum GBF: pro Triangulo HBK, solvendum est Triangulum HBF: pro Triangulo IBK, solvendum est Triangulū IBF. Omnia per axioma quartum.

EXEMPLUM UNICUM.

Heidelbergæ longitudo est 30. gr. 45. m. latitudo Septentrionalis 49. gr. 35. m.

Iavæ majoris, si spectes punctum ejus medium, longitudo est 141. gr. 40. m. latitudo 10. gr.

Differentia longitudinis est 110. gr. 55. m. tanquam angulus GBK, obtusus: cujus compl. est 60. gr. 5. m. angulus FBG, acutus. Distantia quæsita GK.

Complementum latitudinis septentrionalis MG, 49. gr. 35. m. est BG, 40. gr. 25. m.

Complementum latitudinis meridionalis KC, 10 gr. est KD, cui respondet BF, 80. gr. Nam ut KD, est complementū arcus KB, in semicirculo DKB, ita BF, est complementum arcus KB, in semicirculo KBF.

Igitur

Igitur in Triangulo FBG, calculus talis erit.

BG, 40. 25. — — 40. 25.
BF, 80. 0. 10. 0.

120. 25. 50. 25. — 77010.
30. 25. — — — 50628.

FBG, 69. 5. | 100000. 127638.
20. 55. | 35701. 63819.
Sinus versus 64299. 64299.

574371.
574371.
127638.
155276.
382014.

41034. | 97881.
77010. |

35976. Sinus arcus 21. gr. 5. m. qui additus ad quadrantem 90. gr. constituit arcum GK, quæsitum 111. gr. 5. m. cui arcui respondent milliaria Germanica. 1666$\frac{1}{4}$.

FINIS.

BARTHOLOMÆI PITISCI
Grunbergensis

PROBLEMATUM GNOMONICORUM

Liber Unus.

PRÆFATIO.

IN Gnomonicis præstant Solaria: & in his Sciotherica communia: in quibus stylus est axis: lineæ verò horariæ sunt circulorum horariorum, per vicesimas quartas partes Æquatoris, & utrumq; mundi polum incedentium, sectiones communes cum plano dato. Et hæ quidem ab axe facilè deducuntur. At axem collocare; hoc opus, hic labor est: præsertim in planis meridiano obliquis: in quibus omnibus, tàm meridiana plani, quã elevatio poli supra planũ, atq; adeo elevatio axis supra meridianam plani, & in nonnullis etjam meridiana loci ignoratur. De his igitur, scitu perquàm utilibus & jucundis, tria hoc loco Problemata proponemus: & in gratiam studiosæ juventutis addemus quartum, de lineis horariis in quovis plano ducendis.

PROBLEMA PRIMUM.

Dato plano, & ad meridianum & ad verticalem primarium obliquo, sed ad horizontem recto, hoc est, dato plano simpliciter declinato, meridianam plani & elevationem poli supra planum invenire.

Meri-

Meridianam plani voco communem sectionem meridiani proprii cum plano dato. Nam unumquodque planum, ut horizontem, ita meridianum habet proprium, qui est circulus per polos mundi & plani ductus, atque idcirco, tam plano, quàm Æquatori normalis. In quo circulo numeratur elevatio poli supra planum: quæ nihil aliud est, quàm arcus meridiani proprii, inter horizontem plani, hoc est, inter circulum maximum, cui planum æquidistat, & polum proximum interceptus.

Sit ergo meridianus loci ABCD. Horizon AEC, verticalis primarius BED, punctum orientale E, planum verticale BKD, horizonti rectum ad F, at à verticali primario declinatum angulo EBF, sive arcu EF, cujus complementum est angulus FBC, sive arcus FC. Et sint poli mundi G & I, polus plani H, adeoque meridianus plani GHI, plano rectus ad *K*, centrum mundi L, communis sectio meridiani loci cum plano dato atque adeo meridiana loci BLD,

communis ſectio meridiani proprii cum plano dato, atque adeo meridiana plani KLM. Quærantur autem 1. elevatio poli G, ſupra faciem plani ſeptentrionalem, ſive ſupra punctum K, hoc eſt, arcus GK, cui ex oppoſito reſpondet arcus MI, elevatio poli antarctici I, ſupra faciem plani meridionalem, nempe ſupra punctum M, 2. diſtantia meridianæ plani KLM, à meridiana loci BLD, hoc eſt, angulus BLK, vel MLD quem metitur arcus BK, vel MD.

Factis quadrantibus KN & FN, quia in Triangulo GCN, data ſunt duo latera rectum includentia: nempe GC, elevatio poli, & CN, declinatio plani. (Nam CN & EF æquantur, per ſtructuram.) Ideo primum ſolvo Triangulum GCN. per ax. 4. Deinde reperto arcu GK, in Triangulo BGK, dico:

Ut CF, tang. ad FB, rad. ita GK, tang. ad KB, ſin. per ax. 2.

Vel.

Ut radius ad tangentem complementi CF, ita GK, tang. ad KB, ſinum per compendium 2.

EXEMPLUM. Sit planum meridionale (hoc eſt, meridiei obverſum) ſed declinatum dextrum, (hoc eſt, verſus orientē) 30. gr. Et ſit elevatio poli 49. gr. 35. m. Quærantur autem & diſtantia meridianæ plani à meridiana loci, & elevatio poli ſupra planum: ſive, quod idem eſt, elevatio axis, ſupra meridianam plani.

I. Primum ſolvo Triangulum GCN, per axioma quartum, hoc modo:

CN, 30. 0.	— 30. 0.		
GC, 49. 35.	— 40. 25.		
79. 35.	70. 25.	—	94215.
10. 25.	—	—	18080.
			112295.
			56147, Sinus arcus GK, 34. gr.

34. gr. 9½. m. Quæ est elevatio poli arctici supra faciem plani septentrionalem, cui ex opposito æquatur arcus MI, elevatio poli antarctici supra faciem plani meridionalem.

II. Deinde in Triangulo BKG, dico: per ax. 2.

Ut CF, tang. 60. gr. ad FB, rad. ita GK, tang. 34. gr. 9½. m.

173205. 100000. 67850.

ad 39173. sinum arcus BK, vel DM, distantiæ meridianæ plani à meridiana loci, 23. gr. 4. m.

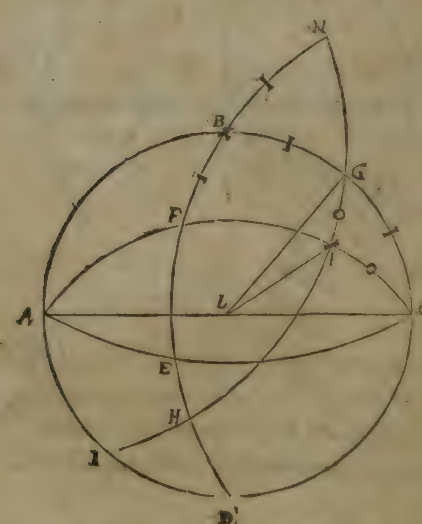
Ergo in tali plano, si horizon loci sit ◡AC, meridiana loci LD, descripto horizonte plani ◡ABCD, (in praxi sufficit quadrans ◡AD.) & numeratis à D, in M, 23. gradibus, 4. minutis, & ab M, in I, 34. gr.

9½. min. meridiana plani (quam vulgò vocant substylarem) erit LM. Elevatio poli antarctici MI, (quasi jam arcus ◡MI, esset meridianus proprius supra punctum M, perpendiculariter erectus,) adeoq; axis LI, extollendus supra meridianam plani L◡M, angulo MLI.

PROBLEMA SECUNDUM.

Dato plano & ad meridianum & ad horizontem obliquo; sed ad verticalem primarium recto: hoc est, dato plano simpliciter inclinato: (qualia plani sunt, quæ ab ortu versus occasum, aut contra, ab occasu versus ortum inclinantur) meridianam plani, & elevationem poli supra planum invenire.

Sit meridianus loci ABCD, horizon AEC, verticalis primarius BED, punctum occidentale, sed ab oriente spectatum E, planum orienti obversum, AFC, sed à puncto verticali B, versus punctum occidentale E, inclinatum arcu BF, angulis ad F, rectis. Et sint poli mundi G & I, polus plani H, adeoque meridianus plani GHI, & per consequens, elevatio poli arctici supra planum arcus KG, & distantia meridianæ plani LK, à meridiana loci LC, arcus KC. Qui duo arcus quærantur.



Conti-

Continuatis lateribus FB & KG.& factis quadrantibus FN & KN, quia in Triangulo BNG, nota sunt duo latera, includentia rectum ad B, nempe BN, complementum inclinationis poli, & BG, complementum elevationis poli. Primùm ſolvo Triangulum BNG, per ax. 4. Deinde, reperto per ax. 4. arcu GK. dico per ax. 2.

Ut BF, tang. ad FC, rad. ita GK, tangent. ad KC, ſinum.

Vel per compendium 2.

Ut rad. ad tang. complementi BF, ita GK, tang. ad KC.

EXEMPLUM. Sit planum orientale inclinatum 30. grad. adeoq; arcus BF, ſit 30. gr. BN. 60. gr. Elevatio poli GC, 49. gr. 35. m. complementum elevationis poli GB, 40. gr. 25. m. Quærantur autem arcus GK, & KC, ſive anguli GLK & KLC. hoc eſt, ut vulgo loquuntur: quærantur, diſtantia ſtyli GL, à ſubſtylari KL, & hujus à meridiana loci CL.

Primum ſolvo Triangulum BNG, per ax. 4. hoc modo.

BG, 40.25.	— 49.35.		
BN, 60.25.	— 30. 0.		
100.25.	79.35.	—	98352.
10.25.	—	—	18080.
			80272.
			40136.

Sinus arcus GK, diſtantiæ ſtyli à ſubſtylari, 23. grad. 40. min.

Deinde in Triangulo GKC, dico: per ax. 2. vel per compend. 2.

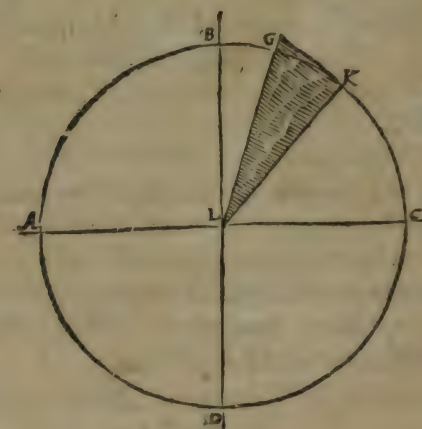
Ut BF, tang. 30. gr. ad FC, ita GK, tang. 23. gr. 40′.

57735.	100000.	43827.

Ad

Ad 75910.ſinum arcus KC, diſtantiæ ſubſtylaris ſive meridianæ plani à meridiana loci 49.gr.23.m.per 2.ax.ſphær.

In tali igitur plano ſi horizontalis, eademq; meridiana loci ſit AC, verticalis BD, numeratis in quadrante horizontis plani BC, gr. 49. gr. 23'. à C, in K, meridiana plani, ſive ſubſtylaris erit LK, & inde à K, in



G, numeratis 23. gr. 40. m. elevatio poli borealis ſupra planum erit GK, adeoq; axis erit LG, extollendus ſupra meridianam plani angulo KLG.

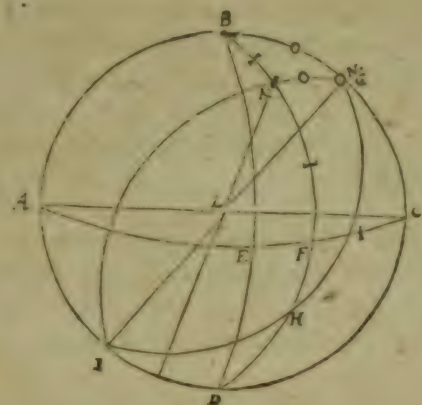
PROBLEMA TERTIUM.

Dato plano & ad meridianum, & ad horizontem, & ad verticalem primarium obliquo, hoc eſt, dato plano inclinato declinato, meridianã, tàm loci, quàm plani, & elevationem poli ſupra planum invenire.

Sit meridianus loci ABCD, Horizon AEC verticalis primarius BED, punctum Orientale E, verticalis declinatus BKD, & ſub eo planum inclinatum NKI, angulis ad K, rectis.

Poli

Poli mundi G & I, polus plani H. Meridianus plani GH. angulus declinationis EBF, arcus inclinationis BK.



Ante omnia autem quæratur arcus KN, diſtantia meridianæ loci NL, à verticali plani KL, per ax. 2. Deinde arcus BN, per axioma 3 vel 4. poſthæc angulus BNK, per ax 3. hoc eſt, ut uno verbo dicam, ſolvatur Triangulum BKN. Quo ſoluto, arcus BN, vel repertus eſt, æqualis complemento elevationis poli BG, vel minor, vel major.

CASUS PRIMUS.

Si arcus BN, repertus fuerit æqualis complemento elevationis poli BG, indicio eſt, planum ſub merid ano obliq; uſq; ad polum inclinatum eſſe. In quo caſu meridiana loci, & plani, itemq; axis, in eandem lineam GL, concurrunt: ſi planum in ipſo circulo maximo KN, conſiſtere fingatur. At ſi planum non in ipſo circulo maximo KN, ſed in aliquo ipſius parallelo

ſ conſi-

conſiſtere fingatur, & axis à plano nonnihil abducatur, (ut neceſſariò fit, ſi ſcioterícum abſoluere libeat) meridianæ loci, & plani ſunt duæ lineæ inter ſeſe parallelæ: & ſejunguntur mutuo ſecundum differentiam longitudinis loci & plani: quæ differentia eſt penes angulum HGC, qui eſt complementum anguli BNK, nuper inventi: quia angulus KGH, eſt rectus per 57. p. 1. quippe cum meridianus plani per polos plani incedat. Tres autem ad G vel N, concurrentes ſunt æquales duobus rectis per 20. p. 1.

EXEMPLUM. Sit planum meridionale declinatum dextrum 29. gr. 59. m. inclinatum verſus polum arcticum 23. grad. 3. m. Elevatio poli 49. gr. 35. m. Quærantur autem in eo meridiana loci & plani, atq; elevatio poli ſive axis ſupra planum. Calculus talis erit.

I. Ut BF, rad. ad FC, 60. gr. 1. m. ita BK, 23. gr. 3'.

100000. tang. 173360. 39152.

Ad 67874. tangentem arcus KN, diſtantiæ meridianæ loci à verticali plani 34. gr. 10. m. per ax. 2.

II. BK, 23. 3.	—	23. 3.	
KN, 34. 10.	—	55. 50.	
57. 13.	78. 53.	—	98123.
32. 47.	—	—	54146.
			152269.
			76134.

Sinus arcus NC, 49. gr. 35. m. cujus compl. eſt arcus BN, 40. gr. 25. m. per ax. 4.

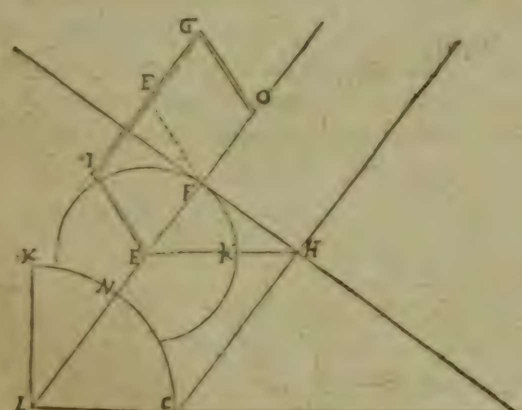
III. Ut BN 40. gr. 52. m ad BKN 90. gr. ita BK, 23. gr. 3'.

64834. 100000. 39122.

Ad

Ad 60388. ſinum anguli BNK, 37. grad. 9. min. cujus compl. eſt angulus HNC, ſive HGC, 52. gr. 51. m. differentia longitudinis plani à longitudine loci, ſive diſtantia meridianorum loci & plani, per ax. 3.

Sit ergo horizon loci LC, verticalis plani KL, Horizon plani, circulus KNC. In quo numerentur à K, verſus C, 34. gr. 10. m. & per terminum numerationis N, trajiciatur recta LNF, quæ eſſet meridiana & plani & loci, ſi centrum Scioterici L, vel F, pro centro mundi & recta LNF, pro axe haberetur. At, quia in perfectione Scioterici axis IG, cum centro mundi E, non in recta LNF, relinquitur, ſed ſupra eam fulcris pro libitu, ſed tamen æque altis EI & OG, extollitur: atq. adeo planũ

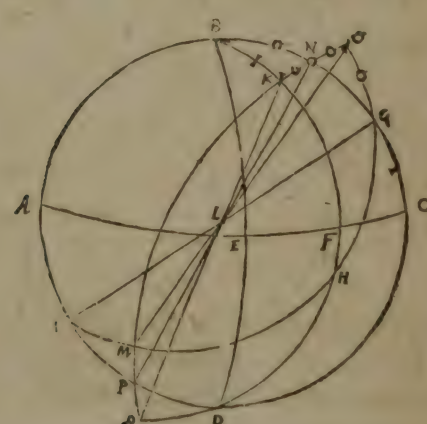


ab axe mundi nonnihil abducitur: ideo linea LNF, jam nõ ſimul eſt meridiana loci, ſed tantũ meridiana plani: ſive, ut vulgò loquuntur, ſubſtylaris. Meridianã autẽ loci ſic invenies. Ad normã meridianæ plani, ductâ cõmuni ſectione Æquatoris cum plano (vulgo lineã contingentiæ

vocant) FH, centrum mundi E, ab axe IG, reponatur in meridianam plani LNF. Deinde centro E, consistente in linea LNE, describatur circulus Æquatoris FK, & in eo versus orientem (quia horizon plani est horizonte loci orientalior, adeoq; citiùs à sole irradiatur meridiana plani, quàm loci) numeretur differentia longitudinis loci & plani 52. grad. 51. min. & per terminum numerationis K, ducatur recta, tanquam radius quispiam Æquatoris EKH, quæ ubi attigerit communem sectionem Æquatoris cum plano, nempe rectam FH, per id punctum agatur normaliter meridiana loci CH.

CASUS SECUNDUS.

Si verò arcus BN, repertus fuerit minor complemento elevationis poli, indicio est, planum citra polum arcticum consistere, adeoq supra tale planum non polum arcticum G, sed polum antarcticum I, extolli debere, angulo tanto, quantus est ILM, cujus mensura est arcus IM, cui ex opposito æquatur arcus GO, Quem unà cum arcu NO, porrò sic invenies.



IV. Ut NOG, rectus ad NG, differentiam inter BN, & BG, ita ONG, angulus antea repertus, ad OG, per ax. 3.

V. Ut tangens ONG, ad rad. ita tangens OG, ad sinum ON, per ax. 2.

EXEMPLUM. Sit planum meridionale declinatum dextrũ 34. gr. 30. m. inclinatum versus polum arcticum 16. gr. 10. m. Et elevatio poli rursum sit 49. gr. 35. m. Quærantur autem meridiana loci & plani, unà cum elevatione poli supra planum. Calculus talis erit.

I. Ut BF, rad. ad FC. compl. decl. 55. gr. 30′. ita BK, incl. 16. gr. 10′.

100000.	Tang. 145501.	Sin. 27843.

Ad 40511. tangentem KN, 22 gr. $3\frac{1}{7}$. m. distantiam meridianæ loci à verticali plani per ax. 2.

II.	BK, 16. 10.	—	16. 10.		
	KN, 22. $3\frac{1}{7}$.	—	67. $56\frac{2}{7}$.		
	$38. 13\frac{1}{7}$.	—	$84. 6\frac{2}{7}$.	—	99472.
	$51. 46\frac{2}{7}$.	—	—		78561.
					178033.
					89016. Sinus

Arcus NG, 62. gr. $53\frac{2}{7}$. cujus compl. est BN, 27. gr. $6\frac{1}{7}$. m. quo subtracto de BG, complemento elevationis poli 40. grad. 25. min. relinquitur arcus NG, 13. grad. $18\frac{2}{7}$. m. per ax. 4.

III. Ut BN, 27. gr. $6\frac{1}{7}$. ad BKN, rad. ita BK, 16. gr. 10′.

45563.	100000.	27843.

Ad 61108. sinum anguli BNK, vel ONG, 37. grad. 40. min. per ax. 3.

IV. Ut NOG, rectus, ad NG, 13. gr. $18\frac{1}{3}$. m. ita GNO, 37. gr. 40′.

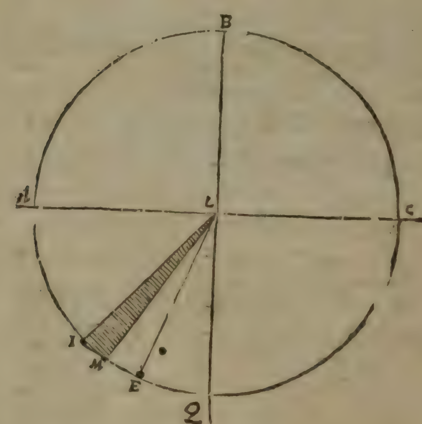
100000.	23024.	61108.

Ad 14069. ſinum arcus OG, diſtantiæ axis GL, à meridiana plani OL, 8. gr. $5\frac{1}{3}$. m. per ax. 3.

V. Ut tang. GNO, 37. gr. 40′. ad rad. ita tang GO, 8. gr. $5'\frac{1}{3}$.

77196.	100000.	14212.

ad 18410. ſinum arcus NO, diſtantiæ meridianæ plani OL, à meridiana loci NL, 30. gr. $36\frac{1}{2}$. m. per ax. 2.



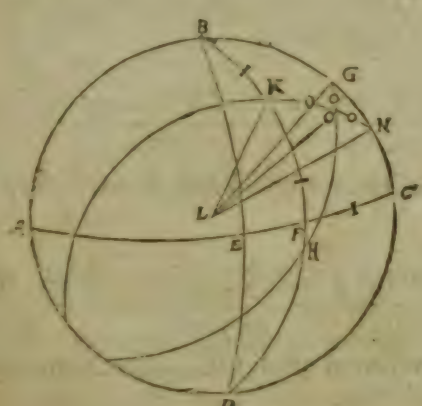
Calculo abſoluto ducantur 1. horizon loci ⌣AC, 2. verticalis plani BQ, 3. Horizon plani ⌣ABCQ, 4. In cujus quadrante ⌣AQ, (nempe juxta polum antarcticum, qui ſolus ſupra tale planum exſtat) primum numeretur diſtantia meridianæ loci à verticali plani 22. gr. 3. m. & per terminum numerationis P, ducatur meridiana plani LP. Deinde à puncto P, numeretur diſtantia meridianæ plani à meridiana loci, 10. gr. $36\frac{1}{2}$. min. & per terminum numerationis ⌣M, ducatur meridiana plani LM. Deniq; à puncto M, in quamcunq; partem numeretur elevatio

poli

poli propria, sive distantia axis à meridiana plani 8.gr.5$\frac{7}{3}$.m. & per terminum numerationis I. agatur axis LI, extollendus supra meridianam plani LM, angulo MLI.

CASUS TERTIUS.

Si denique arcus BN, repertus fuerit major complemento elevationis poli BG, indicio est, planum ultra polum arcticum inclinatum esse: adeoq; polum arcticum supra tale planum extolli debere, angulo tanto, quantus est angulus GLO, quem metitur arcus GO, quem arcum unà cum arcu ON, porrò ita reperies, ut in casu præcedente.



EXEMPLUM. Sit planum meridionale declinatum dextrum 35.gr.54.m. inclinatum versus polum arcticum 75.gr.43 m. Et sit rursum elevatio poli 49.gr.35.m. Quærantur autem meridiana loci & plani, unà cum elevatione poli supra planũ. Calculus talis erit.

I. Ut

I. Ut BF, rad. ad FC, 54. gr. 6′. ita BK, 75. gr. 43′.

100000. tang. 138144. Sinus 96909.

Ad 133874. tangentem arcus KN, diſtantiæ meridianæ loci à verticali plani 53. gr. 14$\frac{1}{2}$. m. per ax. 2.

II. KN, 53. gr. 14′$\frac{1}{2}$.		—	53. gr. 14$\frac{1}{2}$.			
BK, 75.	43.	—	14.	17.		
128.	57$\frac{1}{2}$.		67.	31$\frac{1}{2}$.	—	92404.
38.	57$\frac{1}{2}$.					62875.
						29529.
						14764.

Sinus arcus NC, 8. gr. 29$\frac{1}{2}$. m. cujus complementum eſt BN, 81. gr. 30$\frac{1}{2}$. m. Unde ſi ſubtrahas BG, 40. gr. 25. m. reſtabit arcus GN, 41. gr. 5$\frac{1}{2}$. m. per ax. 4.

III. Ut BN, 81. gr. 30. $\frac{1}{2}$. ad BKN, 90. gr. ita BK, 75. gr. 43′.

98903. 100000. 96909.

Ad 97982. ſinum anguli BNK, ſive ONG, 78. grad. 16. m. per ax. 3.

IV. Ut NOG, rectus ad NG, 41. gr. 5$\frac{1}{2}$. m. ita ONG, 78. gr. 16′.

100000. 65726. 97982.

Ad 64399. ſinum arcus OG, diſtantiam axis à meridiana plani 40. gr. 5$\frac{1}{3}$. m. per ax. 3.

V. Ut tang. GNO, 78. gr. 16′. ad rad. ita tang. GO, 40. gr. 5′$\frac{1}{2}$.

481470. 100000. 84182.

Ad 17483. ſinum arcus ON, diſtantiæ meridianæ plani à meridiana loci 10. gr. 4. m. per ax.

Calculo

Calculo absoluto: sit horizon loci AC, verticalis plani KD, horizon plani AKCD. In quo primum numeretur à puncto verticali K, versus C, distantia meridianæ loci à verticali plani 53. grad. 14½. & per terminum numerationis N, ducatur meridiana loci, LN. Deinde à meridiana loci, nempe à puncto N, retronu-

meretur distantia meridianæ plani 10. grad. 4. m. & per terminum numerationis O, ducatur meridiana plani LO. A qua deinceps numeretur elevatio poli propria, sive distantia axis, à meridiana plani 48. gr. 5½. m. & per terminũ numerationis G, ducatur axis LG, extollendus supra meridianam plani LO, angulo GLO.

PROBLEMA QUARTUM.

Lineas horarias in quovis plano ducere.

Axis est plano adversus, vel parallelus.

Si axis sit plano adversus; lineæ horariæ omnes ad radicem

axis, ſive ad centrum Scioterici concurrunt. Cùm enim plana circulorum horariorum omnia ad axem concurrant: etiã ſectiones illorum planorũ, à plano Scioterici factas, ad axem concurrere neceſſe eſt.

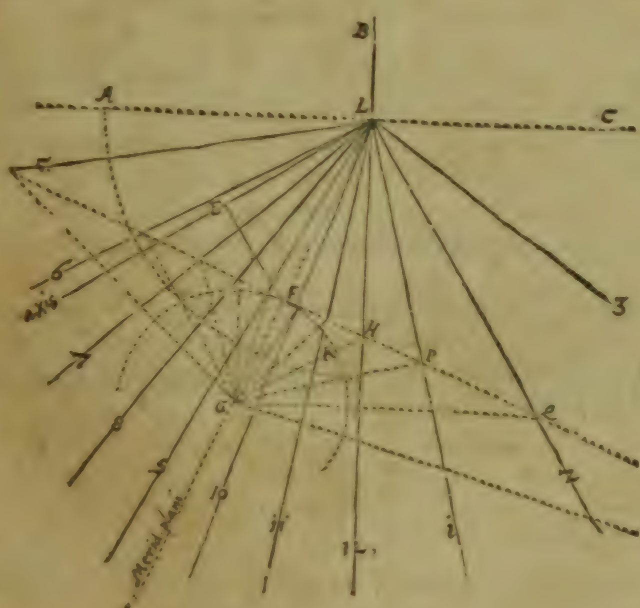
Axis autem plano adverſus, eſt eidem rectus, vel obliquus. Si axis ſit plano rectus, ut eſt in plano ad æquatorem parallelo, lineæ horariæ omnes æqualibus invicem angulis ad radicem axis concurrunt.

Deſcriptio igitur in tali plano circulo æquatoris, & eodem in 24. partes diviſo, ac diviſionibus ad centrum Scioterici ductis, lineæ horariæ ductæ erunt: ut factum vides in adjuncta figura.

Si axis ſit plano obliquus: ut eſt in quovis plano ad Æquatorem obliquo: lineæ horariæ pleraq; inæqualibus ad axem angulis concurrunt. Reperiuntur autem facilimè hoc modo.

A puncto

A puncto quolibet axis tanquam à centro mundi, verbi gratia, in meridionali declinato dextro 30. grad. à puncto axis E, ducatur recta normalis tanquam radius quispiam Æquatoris EF, quæ recta ubi in meridianam plani inciderit, (sive ea sit eadem cum meridiana loci sive non) ibi per meridianam plani trajiciatur alia recta normalis FQ, quæ erit communis sectio æquatoris cum plano. Deinde radius Æquatoris FE, reponatur in meridianam plani, ut sit FG. Atque ex G, tanquam ex centro mundi describatur circulus Æquatoris quantuslibet FK. Ac rursus ducatur alius radius Æquatoris è centro G, ad intersectionem lineæ æquatoris cum meridia-

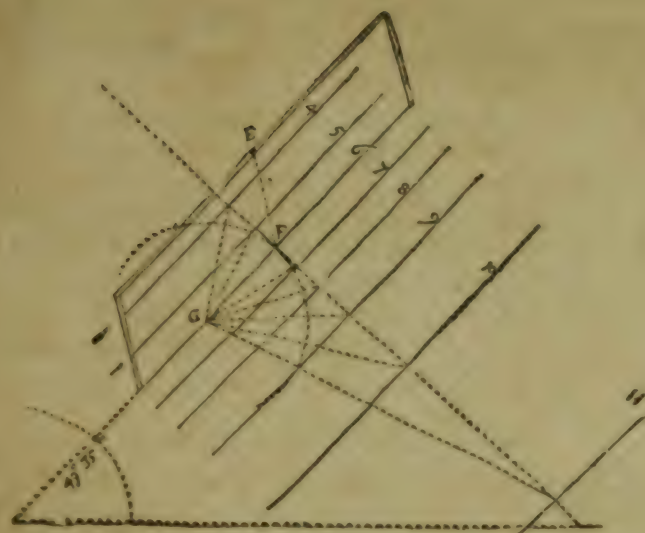


na loci, ſive cum linea horæ duodecimæ. Qui radius ubi ſecuerit circulum Æquatoris (hic autem ſecat in puncto K) inde initio facto ſemicirculus Æquatoris, communi ſectioni Æquatoris & plani oppoſitus dividatur in partes æquales 12, ac per ſingulas diviſiones è centro G, ducantur rectæ deletiles, quales ſunt GP, GQ, &c. quæ ubi communem ſectionem Æquatoris & plani attigerint, ibi lineæ horariæ diviſionibus illis reſpondentes neceſſariò tranſibunt. Et ſic ſingularum horariarum ducendarum duo puncta habebuntur, unum in centro Scioterici L, ubi omnes concurrunt: alterum in communi ſectione Æquatoris, & plani, ſive in linea FQ, per quam omnes tranſeunt. Per quæ duo puncta ſi ducantur rectæ LQ, LP, &c. lineæ horariæ ductæ erunt.

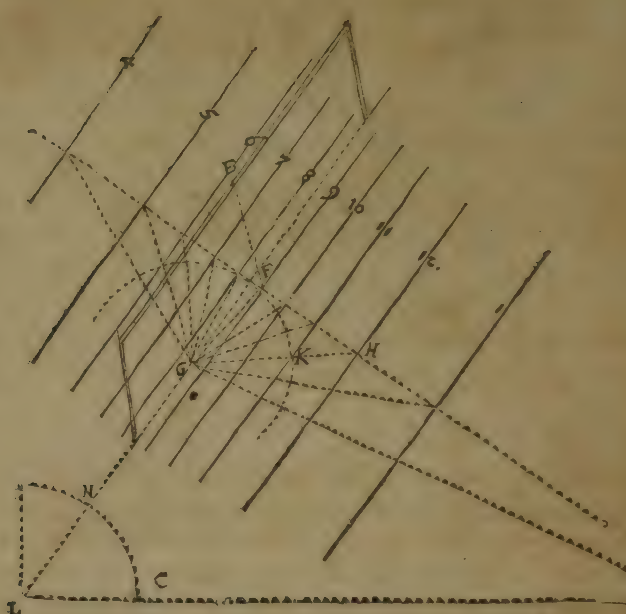
¶ *Si axis ſit plano parallelus, ut eſt in plano quovis ad Æquatorem recto: (qualia plana nobis ſunt è verticalibus orientalia & occidentalia, & ex inclinatis ea, quæ uſque ad polum inclinantur) lineæ horariæ nuſquam in plano concurrunt: quia totus earum concurſus eſt ad axem, qui tale planum nuſquam attingit: ſed ſunt invicem parallelæ: quia omnes ſunt ad axem parallelæ: propter axem plano parallelum.*

Reperiuntur autem eodem ferè modo, quo illæ quæ ad axem concurrunt: nempe lineâ Æquatoris per circulum Æquatoris in ſuas horas diviſâ. Tantum hoc intereſt, quod ibi per duo puncta oblique: hic per unicum punctum rectè ducuntur.

EXEM-



EXEMPLUM primum esto verticale orientale, in quo divisio circuli Æquatoris incipit ab horaria sexta: quæ eadem in tali plano, ut etiam in plano occidentali est meridiana plani. Nam meridiana loci in hujusmodi plana non incidit: quippe cum hujusmodi plana à meridiano loci non secentur, sed sint ipsi parallela.



EXEMPLUM alterum eſto meridionale declinatum dextrum 29. grad. 59. min. ſub verticali ſuo rectè inclinatum 23. grad. 3. min. at ſub meridiano obliquè inclinatum 40. grad. 25. min. hoc eſt, uſq; ad polum. In quo diviſio circuli Æquatoris prorſus ut in obliqui ſtylaribus incipit à puncto K. Cætera fiunt, ut in planis orientalibus & occidentalibus.

BAR-

BARTHOLOMÆI PITISCI
Grunbergenſis

PROBLEMATUM ASTRONOMICORVM

Libri Sex.

PRÆFATIO.

ASTronomiæ partes (meo quidem judicio) ſunt duæ: una de motu ſtellarum omnium communi: Altera de motu, tàm fixarum, quàm erraticarum proprio. Motus ſtellarum omnium communis rurſum eſt duplex: unus revolutionis, alter trepidationis. Motus revolutionis ſtellarum omnium communis, eſt motus circularis perfectus & æqualis, circa axem mundi & ſuper polis mundi, non in nona, vel decima aliqua Sphæra, ſed in ſolo Dei juſſu fixis: ab ortu in occaſum tendens, & periodo ſua definiens tempus, quod Græci νυχθήμερον, q. d. noctidiurnum, latini diem civilem vocant. Motus trepidationis ſtellarum omniũ communis eſt motus circularis imperfectus & inæqualis circa axem coluri Solſtitiorum: quo tota cœlorum machina, tanquam axi zodiaci affixa, modo ad axem mundi accedit propius, modo ab eo recedit longius, & ita obliquitatem Zodiaci & Æquatoris, modo majorem facit, modo minorẽ: hinc inde à medio digrediens per ſcrupula prima duodecim, & ad idẽ extremum rediens, annis Ægyptiis 3434. Motus longitudinis, tàm fixarũ, quàm erraticarũ proprius omnis, eſt motus circularis perfectus, & quoad apparentiam inæqualis: ab occaſu in ortum: fixarum & ſolis, circa

axem

axem Zodiaci: reliquarum erraticarum circa proprios quosdam axes & inter sese & ab axe Zodiaci diversos: unde ipsis præter motum longitudinis, etiam motus latitudinis inesse dicitur. De motu igitur revolutionis stellarum omnium communi, erit Problematum nostrorum liber primus. De motu trepidationis itidem stellarum omnium communi, liber secundus. De motu fixarum proprio, liber tertius. De motu solis proprio, liber quartus. De motu lunæ proprio liber quintus. De calculo Eclipsium Solis & Lunæ liber sextus & postremus.

BARTHOLOMÆI PITISCI
Grunbergensis

PROBLEMATUM
ASTRONOMICORUM

LIBER PRIMUS.

De motu revolutionis ſtellarum omnium communi,

Sive

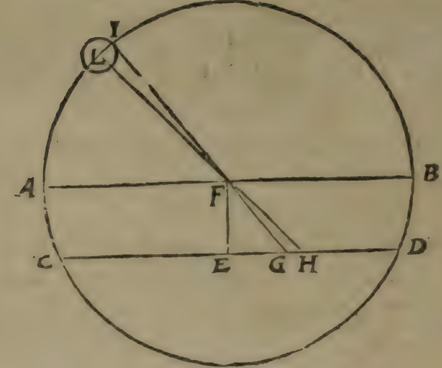
De motu cœli diurno.

PROBLEMA PRIMUM.

Altitudinem Solis ſupra horizontem quovis momento deprehendere. Ptol. lib. 2. c. 5. Cop. lib. 2. c. 6.

Altitudo Solis ſupra horizontem rectiſſimè capitur, per Quadrantem. At colligi tamen etiam poteſt ex umbris, ſive rectis: ſive verſis: hoc modo. Sit planum horizontale CED, & in eo gnomon perpendiculariter erectus EF, extremitate ſua F, centrum mundi referens, & in partes æquales quotlibet, verbi gratia, in partes æquales 100. diviſus. Et ſit obſervata umbra recta Solis EG, ſparſa à ſummitate corporis Solaris I.

u (Nam



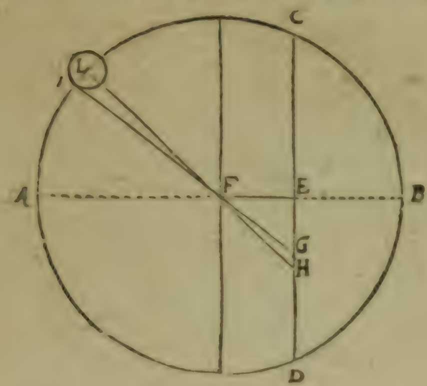
(Nam umbra EH, ſparſa à centro Solis L, tota cerni nequit: propterea quod pars illius umbræ GH, à ſupremo gibbo Solis I, perpetuò illuminatur) Sit inquam obſervata umbra recta ſupremi gibbi ſolaris EG. 75. partium. Quæratur autem angulus EGF, æqualis angulo altitudinis AFI. Dico:

Ut EG, umbra recta,	ad EF, gnomonem,	ita EG, radius.
95.	100.	100000.

Ad EF, 105263. tangentem anguli EGF, ſive AFI, cujus menſura eſt arcus AI, 46. grad. 28. min. unde ſubtractus ſemidiameter Solis LI, 15. min. relinquit altitudinem centri Solis AL, 46. grad. 13. min.

Vel.

Sit planum verticale CED, & in eo gnomon normaliter fixus EF, extremitate ſua attingens centrum mundi F, & in partes æquales 100. diviſus. Et ſit obſervata umbra verſa Solis EG, $103\frac{477}{1000}$. partium, oſtendens altitudinem imi gibbi Solis I. (Nam umbra centri EH, rurſus tota cerni nequit: quia pars HG, ab



HG, ab imo gibbo Solis I, illuminatur.) Quæratur autem angulus altitudinis EFG, sive IFA. Dico:

Ut FE, gnomon ad EG, umbram versam: ita FE, rad.

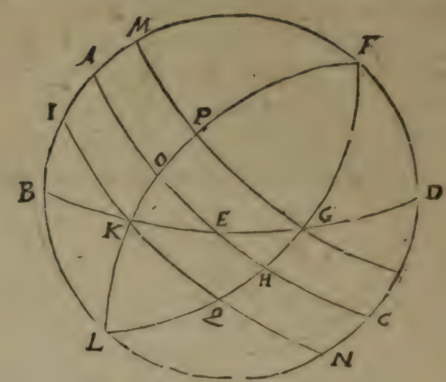
100. $103\frac{432}{1000}$. 100000.

Ad EG, 103432. tangentem anguli EFG, vel IFA. hoc est, arcus IA, 45. gr. 58 m. cui si addas semidiametrum Solis IL, 15. min. efficitur altitudo centri Solis 46. gr. 13. min.

PROBLEMA SECUNDUM.

Ex altitudine Solis, in meridie utriusq. solstitii capta, distantiam tropicorum, & maximam declinationem Solis ac simul elevationem poli colligere. Ptolem. lib. 1. c. 2. & lib. 2. c. 5. Copern. lib. 2 c. 2.

Altitudinem minorē, verbi gratia BI, subduc à majore BM, quod restat IM est distantia tropicorum IK & MP, cujus distantiæ dimidiū IA, vel AM, est maxima declinatio Solis: quâ additâ ad BI, vel subtractâ de BM. ostēditur BA, elevatio Æquatoris AEC, supra horizontē BED, cui elevationi Æquatoris



BA, ex oppoſito reſpondet depreſſio Æquatoris DC, cujus complementum eſt DF, elevatio poli F, ſupra horizontis punctum D.

EXEMPLUM. Sit obſervata Heidelbergæ altitudo Solis in bruma BI, 16. grad. 57. min. At in Solſtitio æſtivo BM, 63. grad. 53. min.

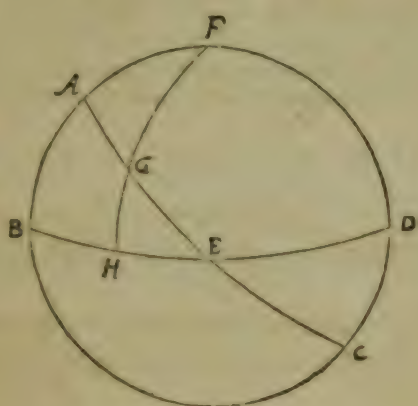
	Erunt
	BM, 63. 53.
	BI, 16. 57.
Diſtantia tropicorum.	IM, 46. 56.
Maxima declinatio.	IA, 23. 28.
Elevatio Æquatoris.	BA, 40. 25.
Elevatio poli.	DF, 49. 35.

PROBLEMA TERTIUM.

Data maxima declinatione Solis, ſingularum ſigniferi partium declinationes invenire. Ptol. lib. 1. cap. 13. Cop. lib. 2. cap. 3.

Sit

Sit colurus solstitiorum, idemq; Meridianus ABCD. Æquator BED. Signifer AEC, polus Æquatoris F, meridianus quispiam FGH, abscindens de signifero arcum EG, & notans punctum G, cujus quæratur declinatio GH. Sint autem data, arcus Signiferi EG, 30. grad. unà cum ipsius complemento GA, 60. grad. Item declinatio maxima AEB, vel



AB, 23. grad. 28. min. unà cum ipsius complemento AF, 66. grad. 32. m. Quia igitur circuli FAB, & FGH, per polum Æquatoris F, & signifer AEC, per polum coluri ABCD, transeunt: ideo anguli ad A, B, & H, sunt recti per 57. p. 1. Quia verò anguli ad A, B, & H, sunt recti; ideò, vel solvo Triangulum HEG, per axioma primum aut tertium; & dico:

Ut EA, ad BA, 23. grad. 28'. ita EG, 30. grad.

100000. 39822. 50000.

Ad GH, 19911—11. grad. 29. min. vel quod multò est compendiosius solvo Triangulum AFG, per axioma quartum, hoc modo.

AG, 60. 0.	—	60. 0.		
AF, 66. 32.	—	23. 28.		
126. 32.		83. 28.	—	99350.
Exc. 36. 32.	—		—	59529.
				39821.
				19910.

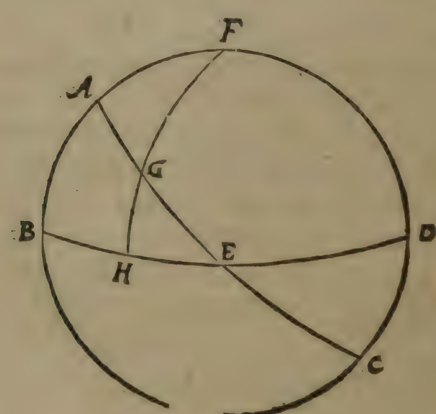
Sinus arcus FG, 11. grad. 29. min.

NB. *Hoc modo, nempe per axioma quartum, omnes & declinationes Solis & latitudines reliquorum planetarum absq; omni, vel multiplicatione, vel divisione, per solam additionem, & subtractionem reperire potes.*

PROBLEMA QUARTUM.

Data maxima declinatione Solis singularum Signiferi partium ascensiones rectas invenire. Ptolom. lib. 1, cap. 14. Cop. lib. 2. c. 3.

Ascensio recta alicujus partis Signiferi dicitur arcus Æquatoris, qui cum illa parte in Sphæra recta simul ascendit. Ut



partis

partis Signiferi GE, aſcenſio recta eſt HE, quia punctũ H, eodem momento cum puncto G, attingit horizontem [illegible] ctum FGH. Notum enim eſt è Sphæricis, quemvis circulum per polos mundi ductum eſſe horizontem in aliqua regione ſub Sphæra recta (hoc eſt, ſub æquatore) ſita.

Sint igitur data, quæ pridem: nempe arcus Signiferi EG, 30. grad. unà cum ipſius complemento GA, 60. grad. Et maxima declinatio Solis AB, 23. gr. 28. min. unà cum ipſius complemento AF, 66. grad. 32. min. Et deniq; anguli ad A, B & H, recti. Quæratur autem aſcenſio recta HE. Dico, in Triangulo BFH.

Ut AF, 66, grad. 32. m. ad	AG, 60. grad. ita	FB, 90. grad.
Sinus 91792.	tang. 173205.	100000.

Ad BH, 188 2 2. tangentem arcus 62. gr. 6. m. cujus complementum eſt HE, 27. gr. 54. m. aſcenſio recta quæſita, per ax. 2. & per compend. 1.

PROBLEMA QUINTUM.

Datis declinatione & aſcenſione recta unà cum elevatione poli, ſingularum Signiferi partium aſcenſiones obliquas invenire. Ptol. lib. 2 c. 7. Cop. lib. 2. c. 3.

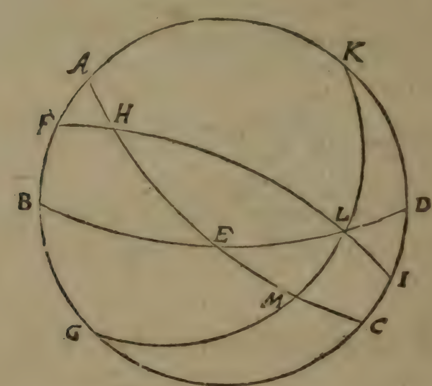
Aſcenſio obliqua alicujus partis Signiferi dicitur arcus Æquatoris, qui cum illa parte in Sphæra obliqua ſimul aſcendit: ut aſcenſio obliqua partis Signiferi HL, eſt arcus Æquatoris HE, quia arcus ille HE ſimul aſcendit ſupra horizontem obliquum BED, in ſphæra obliqua: in qua elevatio poli eſt DK.

CASUS

CASUS PRIMUS.

Si Sol sit in signo aliquo boreo, qualia signa sunt ♈, ♉, ♊, ♋, ♌, ♍.

Sit meridianus ABCD, Æquator AEC, Signifer FLI, Horizon obliquus BED, elevatio poli DK. Arcus aliquis Signiferi HL, ejusq; declinatio LM, & ascensio recta HM, ascensio obliqua HE, differentia ascensionalis EM. Et in Triangulo ELM, sint data præter rectum ad M, compl. elevationis poli



LEM, sive DC, 40. grad. 25. min. & declinatio LM, 11. gr. 29. min. & denique ascensio recta HM, 27. grad. 54. min. Quæratur autem EM, differentia ascensionalis: quæ demta de ascensione recta HM, relinquat ascensionem obliquam HE. Dico:

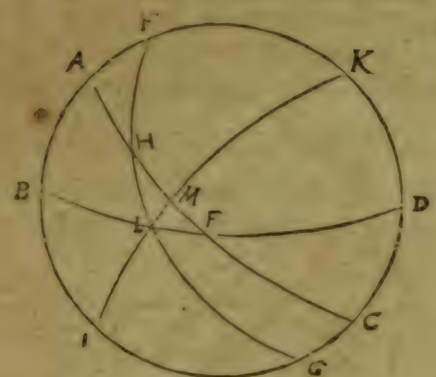
Ut DC, 40. gr. 25. min. ad CE, rad. ita LM, 11. grad. 29'.		
T, 85157.	100000.	T. 20315.

Ad 23855. sinum arcus ME, 13. grad. 48. m. quo detracto de ascensione recta HM, 27. grad. 54, min. relinquitur ascensio obliqua HE, 14. grad. 6. min.

CASUS

CASUS SECUNDUS.

Si Sol ſit in ſigno aliquo auſtrali, qualia ſigna ſunt ♎, ♏, ♐, ♑, ♒, ♓.



Signifero exiſtente FHI, cæteris, ut ante: Sit data portio Signiferi HL, nempe finis libræ, vel principium Scorpii 30. gr. ejuſque declinatio LM, 11. grad. 29′. & aſcenſio recta HM, 27. grad. 54. min, unà cum declinatione maxima, LHM, 23. grad. 28′. Dico:

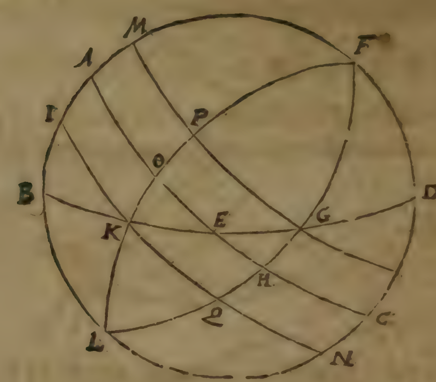
Ut BA, 40. grad. 25. min.	ad AE, rad.	ita LM, 11. 29.
T. 85157.	100000.	T. 20315.

Ad 23855. ſinum arcus EM, 13. grad. 48. min. quo addito ad aſcenſionem rectam HM, 27. gr. 54. m, efficitur aſcenſio obliqua HE, 41. gr. 42. min.

CONSECTARIUM. Differentiæ ergo aſcenſionales in utroq; ſemicirculo Signiferi ſunt eædem: ſed in ſemicirculo boreali ſunt ab aſcenſionibus rectis auferendæ: in ſemicirculo reliquo ſunt ad aſcenſiones rectas addendæ.

PROBLEMA SEXTUM.

Data declinatione Solis, unà cum elevatione poli, singularum signiferi partium arcum semidiurnum, hoc est, quantitatem diei reperire. Copern. lib. 2. c. 7.



Differentia diei inæqualis ab æquali nihil aliud est, quàm differentia ascensionis rectæ ab obliqua: ut Copernicus monet lib. 2. c. 9. Et res ipsa docet. Sit enim principii Tauri G, data declinatio GH, 11. gr. 29. m. unà cum complemento elevationis poli GEH, 40. gr. 25. min. & angulo recto ad H. Quæratur autem arcus Æquatoris EH, qui additus ad quadrantem AE, ostendat quantitatem arcus semidiurni AH, vel in parallelo Solis MG. Ratiocinatio prorsus eadem erit, quæ in Problemate antecedente: nempe.

Ut CD, 40. gr. 25'.	ad CE, rad.	ita GH, 11 gr. 29'.
T. 85157.	100000.	T. 20315.

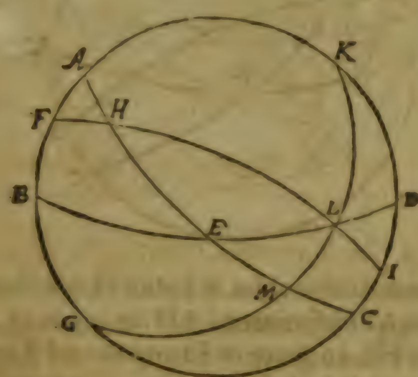
Ad

Ad 23855. ſinum arcus EG, 13 gr. 48′. cui arcui reſpondent, hora o. min. 41. Ergo, quando Sol eſt in principio tauri, dies eſt horarum 13. & 22. minutorum. Nam bis 41 m. ſunt 1. hora, 22. min. quæ addita ad 12. horas efficiunt 13. H, & 22. min.

CONSECTARIUM. Hinc cujuſcunque regionis, ſi data ſit elevatio poli, unà cum declinatione maxima: dabitur etiã dies maximus. Et contra: ſi datus ſit dies maximus, unà cum declinatione maxima, dabitur etiam elevatio poli.

PROBLEMA SEPTIMUM.

Data declinatione Solis, unà cum elevatione poli, ſingularum ſigniferi partium, latitudinem ortivam invenire. Ptol. lib. 2. c. 2. Coper. lib. 2. cap. 7.



Latitudo ortiva dicitur arcus horizontis inter Æquatorem & orientem aliquem ſigniferi gradum interceptus, ut EL. Invenitur autem hoc modo.

Ut LEM, 40 gr. 15′. ad LM, 11. gr. 29′. ita FML, rad.

64834. 19908. 100000.

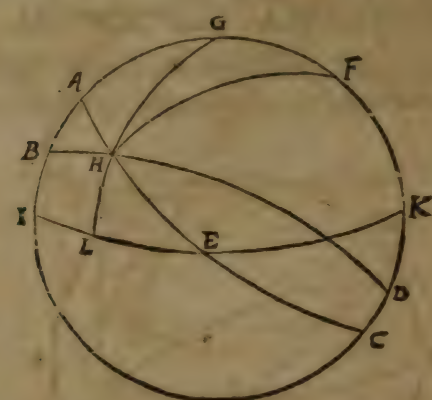
Ad 30706. ſinum arcus EG, 17. gr. 53′.

PROBLEMA OCTAVUM.

Datis loco & declinatione Solis unà cum elevatione poli, altitudinem ejus supra horizontem ad quamvis horam invenire.

CASUS PRIMUS.

Si Sol sit in Æquatore, hoc est, in principio libræ, vel arietis.



Sit horà secunda à meridie, & Sol ad H, constitutus: adeoque sit angulus AFH, sive arcus AH, 30. gr. arcus AG, æqualis elevationi poli FK, 49. gr. 35. m. Et angulus ad A rectus per 57. p. 1. Solvo Triangulum AGH, per ax. 4. hoc modo.

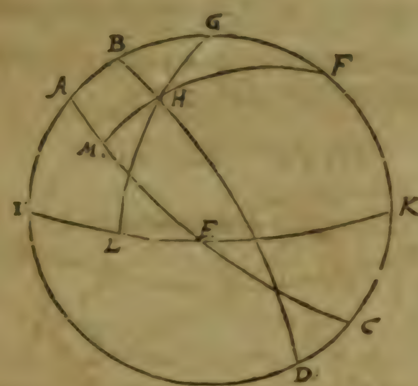
AH, 30. gr.	0′.	—	30. gr.	0′.			
AG, 49.	35.	—	40.	25.			
79.	35.		70.	25.	—	94215.	
10.	25.					18080.	
						112295.	
						56147.	

Sinus

Sinus arcus HL, altitudinis Solis ſupra horizontem 34. grad. 9'.

CASUS SECUNDUS.

Si Sol ſit in aliquo ſigno boreo.



Sit rurſus hora ſecunda à meridie, adeoq; ſit angulus GFH 30. grad. ſive arcus AM. Sol autem ſit in 15. grad. Tauri, nempe ad punctum H, cujus puncti declinatio HM, eſt 16. gr. 21'. & quæratur ejus altitudo HL. Solvendum venit Triangulum obliquangulum FGH, cujus latera duo nota ſunt, FG, complementum elevationis poli 40. grad. 25', & FH, complementum declinationis Solis 73, 39. unà cum angulo GFH, 30. gr. Ita igitur procedo per axioma quartum.

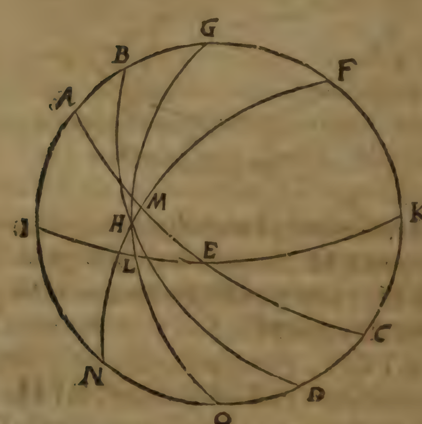
FG, 40. 25.	—	40. 25.		
FH, 73. 39.	—	16. 21.		
114. 4.		56. 46.	—	83644.
24. 4.	—		—	40780.
GFH, 30. gr. 0′	—	100000.		124424.
60. 0′.	—	86602.		62212.
		13398.		

Ut 100000. ad 62212, ita 13398.

Ad 8335. quo detracto de 83644. relinquitur 75309. ſinus arcus HL, altitudinis ſolaris 48. gr. 51′$\frac{1}{2}$.

CASUS TERTIUS.

Si Sol ſit in ſigno aliquo auſtrali.



Sit etiam in hoc caſu data hora ſecunda à meridie, hoc eſt, angulus GFH, etiam in hoc caſu ſit 30. gr. Sol autem in puncto H.

& H, sit constitutus ad principium Scorpii: cujus declinatio HM, est 11.gr. 29'. Arcus igitur FH, est quadrante major: Ergo pro Triangulo GFH, nunc solvo Triangulum NHO, per axioma 4. hoc modo.

NO, 40. 25.	— 40. 25.	
NH, 78. 31.	— 11. 29.	
118. 56.	51. 54.	— 78693.
28. 56.	—	— 48379.
30. 0.		127072.
HNO, 150. 0.	100000	63536.
60. 0.	86602.	
	186602.	

Ut 100000. ad 63536. ita 186602.

Ad 118559. de quo si subtrahas 78693. restabit 39866. sinus excessus tertii lateris, nempe sinus altitudinis solaris HL, 23. grad. 30'.

NOTA. Hæ supputationes altitudinum solarium congruunt cum tertio genere exemplorum quarti axiomatis triangulorum sphæricorũ: ubi parallelus Solis partim supra horizontem exstat, partim infra horizontem demergitur. Quod si verò supputare libeat altitudines Solis in parallelo aliquo semper exstante currentis, illa supputatio instituenda erit, vel per primum, vel per secundum genus exemplorũ ejusdem axiomatis. Per primum genus, si parallelus semper exstans, ab altera parte horizontem attingat. Per secundum genus, si parallelus semper exstans, nusquam horizontem attingat.

PROBLEMA NONUM.

Data altitudine Solis latitudinem ejus à meridiano supputare.

Latitudo Solis à meridiano est arcus horizontis inter meridianum & verticalem, qui per Solem transit, interceptus, ut in

ut in præcedentibus tribus Schematibus arcus IL, Qui arcus facilimè reperitur per axioma 3 hoc modo.

In primo casu præcedentis problematis. (gr.
Ut GH, cõpl. altitudinis 55. gr. 51'. ad GFH, 30. gr. ita FH, 90.

Sin. 82757. Sin. 50000. 100000.

Ad 60417. sinum anguli HGF, vel IGL, hoc est, arcus IL, 37. grad. 10. min.

In secundo casu:

Ut GH, 41. grad. 8½. ad GFH, 30. gr. ita FH, 73. grad. 39'.

65792. 50000. 95956.

Ad 72924. sinum anguli FGH, vel IGL, hoc est, arcus IL, 46. 49½.

In tertio casu:

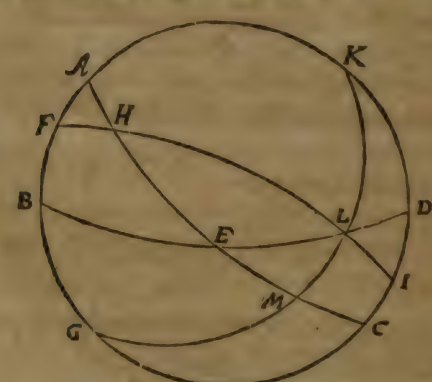
Ut GH, 66. 30. ad GFH, 30. grad. ita FH, 78. 31.

91706. 50000. 97998.

Ad 53430. sinum anguli FGH, vel IGL, hoc est, arcus IL, 32. grad. 18'.

PROBLEMA DECIMUM.

Et Solis & omnium omnino stellarum declinationes observare.



Per

Per Quadrantem obſerva altitudinem ſtellæ in circulo meridiano. Quæ altitudo ſi fuerit major altitudine Æquatoris, hanc ab illa ſubtrahe: ſin minor, fac contrarium: & habebis declinationem ſtellæ quæſitam. Exempli gratia. Si Solis altitudo in circulo meridiano per Quadrantem obſervata ſit BF,35. grad. 12.min. ſubtractis BF,35 grad.12'. de altitudine Æquatoris BA, 40. gr. 25'. remanet declinatio Solis FA,5. grad. 13. min.

PROBLEMA UNDECIMUM.

Ex obſervata declinatione Solis locum ejus in Ecliptica reperire.

Sit obſervata declinatio Solis FA,5. gr. 13.m. Quæratur autem locus ejus in Ecliptica, hoc eſt, quæratur arcus FH. Quia igitur in Triangulo FAH, præter rectum ad A, notus eſt obliquus ad H, nempe declinatio maxima 23 gr. 28. min. & inſuper etiam latus FA, declinatio nuper obſervata, dico per ax. 3.

Ut AHF,23. gr.28'. ad AF,5. gr. 13. min.	ita FAH,90.gr.	
39821.	9092.	100000.

Ad 22831. ſinum arcus FH, 13. gr. 12. m. quo arcu detracto de ſigno piſcium 30 grad. apparet Solem eſſe in 16. grad. 48. min. piſcium.

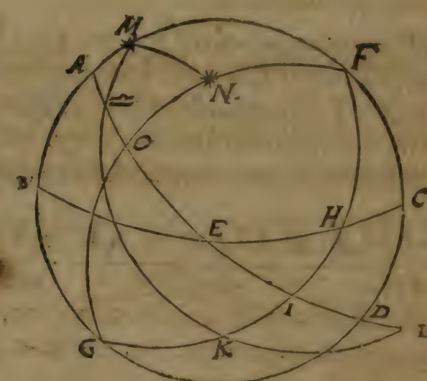
Videtur autem Sol 24. horarum ſpacio unum ferè gradum pertranſire. Veniunt itaq; pro horaria portione ſcrup. 2½. Unde ad quamlibet aliam horam conſtitutam facilè conjectabitur locus ejus, inquit Copernicus lib. 2. cap. 14.

PROBLEMA DUODECIMUM.

Aſcenſiones rectas fixarum invenire.

y Aſcenſio-

Aſcenſionem rectam primæ alicujus ſtellæ fixæ ſic invenies. In meridie obſerva declinationem Solis, & inde collige aſcenſionem ejus rectam per problemata præcedentia. Deinde horologium quoddam automaton indubitatæ fidei exactè compone ad motum Solis. Porrò obſerva, quot horis à meridie ſtella fixa, cujus aſcenſionem rectam inquiris, ad meridianum pervenerit. Deniq; horas illas in gradus & ſcrupula Æquatoris converſas adde ad aſcenſionem rectam Solis, & habebis aſcenſionem rectam ſtellæ fixæ quæſitam. Exempli gratia. Primum in meridie ſit obſervata aſcenſio recta Solis ad K, conſtituti, IL, 80. gr. Deinde horis novem à meridie elapſis



ſit obſervatus tranſitus ſtellæ alicujus fixæ M, per meridianum BAM. Atqui horis novem aſcenderunt IA, 135. grad. $22\frac{1}{2}$. min. ſingulis enim horis aſcendunt 15. gr. $2\frac{1}{2}$. min. Additis ergo IA, 135. $22\frac{1}{2}$. ad IL, 80. gr. manifeſtum fit, aſcenſionem rectam ſtellæ fixæ M hoc eſt, arcum Æquatoris AL, à principio Arietis L, eſſe 225. grad $22\frac{1}{2}$.

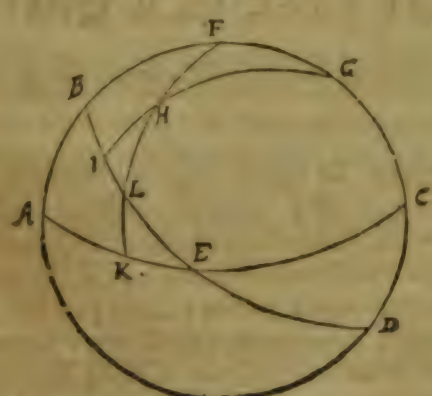
¶ In-

¶ Inventa autem aſcenſione recta unius alicujus ſtellæ fixæ, reliquarum fixarum omnium aſcenſiones rectas inde colliges hoc modo.

Sit prius inventa aſcenſio recta ſtellæ fixæ M, nempe arcus AL. Nunc autem quæratur aſcenſio recta ſtellæ fixæ N, hoc eſt, arcus OL, obſervatis declinationibus AM & ON, per problema 9. & notata diſtantia MN, vel per Quadrantem, vel per Sextantem. Quia in Triangulo MFN, nota ſunt omnia tria latera: nempe MF, & NF, complementa declinationum & MN diſtantia ſtellarun. inde per ax 4. inveſtigabis angulum MFN, cujus menſura eſt arcus AO, quo detracto de aſcenſione recta ſtellæ M, nempe de arcu AL, remanebit arcus OL, aſcenſio recta ſtellæ N.

PROBLEMA DECIMUM TERTIUM.

Data declinatione & aſcenſione recta alicujus ſtellæ fixæ, ejus longitudinem ab æquinoctio verno, & latitudinem ab Ecliptica ſupputare.



Sit meridianus ABG, Æquator AEC, Ecliptica BED, polus Æquatoris F, polus Eclipticæ G, & sit stellæ H, data declinatio HK, & ascensio recta KE: quæratur autem longitudo EI, & latitudo IH. Primum in Triangulo KEL, quia præter rectum ad K, notus est angulus maximæ declinationis Solis KEL, & insuper ascensio recta stellæ KE. Dico

I. Ut EA, rad. ad AB, tang. maximæ declinationis, ita EK, sinus ascensionis rectæ, ad tangentem arcus KL, quo detracto de declinatione stellæ KH, relinquitur arcus LH, per ax. 2.

II. Ut KL, ad KEL, ita KE, ad KLE, per ax. 3, cui æquatur ILH, per 13. p. 1.

III. Ut KEL, ad KL, ita LKE, ad LE, per ax. 3.

IV. Ut HIL, ad HL, ita ILH, ad IH, latitudinem stellæ per ax. 3.

V. Ut tangens ILH, ad rad. ita tangens IH, ad sinum IL, per ax. 2. quo IL, addito ad LE, efficitur arcus IE, quo detracto de circulo toto relinquitur arcus EDBL. Longitudo stellæ ab Æquinoctio verno E.

PROBLEMA DECIMUM QUARTUM.

Data declinatione & latitudine stellæ longitudinem ejus invenire. Cop. lib. 3. c. 2.

Exempli gratia: Sit Spicæ virginis observata altitudo in meridiano 27. grad. ferè. Qualem observavit Copernicus Frueburgi Prussiæ, Anno 1525, ubi elevatio poli est 54. gr. 19'. Declinatio igitur austrina stellæ fuit 8. gr. 40. min. per problema 9. Et sit latitudo stellæ austrina data 2. gr. 0. m. Quæratur autem longitudo. Descripto circulo meridiano per Æquatoris & Eclipticæ polos incedente ABCD, sit sectio communis Æquatoris cum meridiano, adeoque dimetiens Æquatoris

ris AEC, sectio communis Eclipticæ cum meridiano, sive dimetiens Eclipticæ BED, poli Eclipticæ F & G, principium Cancri D, capricorni B. Declinatio austrina Spicæ sit CN vel AM, per cujus declinationis terminos N & M ducatur di-

metiens paralleli Æquatoris per Spicam transeuntis NOM. Latitudo austrina Spicæ sit DL, vel BH, per cujus latitudinis terminos L & H, ducatur dimetiens paralleli Eclipticæ per Spicam transeuntis LOH, quæ dimetiens, ubi secuerit dimetientem Æquatoris, nempe ad punctum O, ibi erit locus Spicæ, ac proinde sinus rectus longitudinis Spicæ à ♎, quippe versus Capricornum, in parallelo suo erit recta IO, quam quærimus.

In Triangulis autem æquiangulis EBR & KHQ, dantur 1. Sinus arcus AB, maximæ declinationis Solis 23. grad. 28. min. nempe sinus RB, 39835.

2. Sinus arcus AH, 25. gr. 28'½. compositi ex maxima declinatione Solis AB, 23. grad. 28'½. & ex latitudine Spicæ austrina BH, 2. gr. nempe sinus RH, 43012.

 3. Si-

3. Sinus declinationis auſtrinæ AM, 8. gr. 40. m. nempe ſinus OP, 15069.

4. Sinus latitudinis auſtrinæ BH, 2. gr. nempe ſinus EI, 3489 & ſinus complementi IL, vel IH, 99939.

Dico igitur per 46. p. 1.

I. Ut RB, 39835, ad BE, 100000, ita QH, 43012. ad HK, 107975.

II. Ut RB, 39835, ad BE, 100000, ita PO, 15069. ad OK, 37828.

Subtracta autem recta OK, 37828, de recta HK, 107975. reſtat recta OH, 70147, qua rurſus ſubtracta de recta IH, 99939, reſtat recta IO. 29792. quâ notâ porrò dico:

III. Ut IH, 99939, eſt 100000, radius, ita IO. 29792.

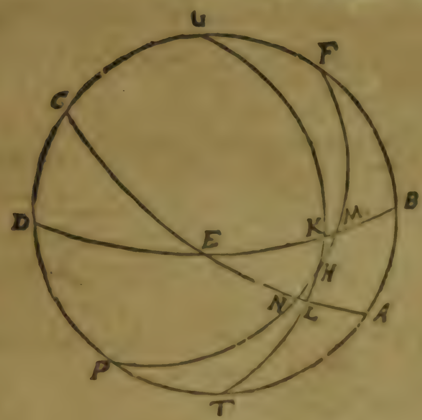
Eſt 29810, ſinus diſtantiæ Spicæ à principio libræ. 17. grad. 20'. 40''. Cui ſi addas ſemicirculum 180. gr. habebis longitudinem Spicæ ab Æquinoctio verno 197. gr. 20'. 40''. ad tempus obſervationis Copernici.

PROBLEMA DECIMUM QUINTUM.

Data longitudine & latitudine ſtellæ, ejus declinationem & aſcenſionem rectam, ſimulq; medium cœli reperire. Copern. lib. 2. cap. 4.

Sit circulus per polos Æquatoris & Signiferi ductus, nempe colurus ſolſtitiorum ABCD. Æquator AEC. Signifer BED poli Æquatoris F, & P. Poli Signiferi G & T, Stella quæpiam H, circulus per polos Æquatoris & centrum ſtellæ incedens FHP, adeoq; declinatio ſtellæ HN, aſcenſio recta EN. Circulus quiſpiam per polos Signiferi & centrum ſtellæ incedens GHT, adeoque latitudo ſtellæ HK, longitudo EK, medium cœli, (hoc eſt, gradus Eclipticæ, cum quo ſtella H, meridianū attingit) EM. Et ſint data.

BA, ma-



BA, maxima declinatio Solis 23.gr.28'.

EK, longitudo ſtellæ H, nempe oculi ♉, ab æquinoctio verno. 63 gr. 58'. ad an. NC,1588.

HK, latitudo ejuſdem ſtellæ perpetua, verſus auſtrum 5. gr. 10'.

Quærantur autem

HN, declinatio

EN, aſcenſio recta &

EM, medium cœli, ejuſdem ſtellæ.

Inquiſitio.

In Triangulo PTH, tria nota ſunt.

1. Latus PT, æquale lateri AB, 23. gr. 28'.

2. Latus TH, complementum latitudinis ſtellæ 84. gr. 50'.

3. Angulus HTP, complementum anguli KTB, qui angulus eſt complementum longitudinis ſtellæ 26. gr. 2. m. Unde angulus HTP, eſt 153. gr. 58'.

Et nota

Et nota duo latera notum angulum includunt.

Inquiro igitur latus tertium PH, per ax. 4. hoc modo.

PT, 23. gr. 28'. — 23. gr. 28'.
TH, 84. 50. — 5. 10.

108. 18. 28. 38. — 47920.
18. 18. — — 31399.

79319.
39659. med. rectæ.

HTP, 153. 58.
90. 100000.

63. 58. -- 89854.
189854. Sinus versus.

Ut 100000, ad 39659, ita 189854.

Ad 75294, unde detractus sinus 47920, relinquit 27374, sinum rectum excessus tertii lateris, nempe declinationis stellæ HN, 15. gr. 53'. cui si addas quadrantem PN, simul innotescit totum tertium latus PH, 105. grad. 53'. ejusque compl. ad semicirculum, hoc est, complementum declinationis stellæ HF, 74. gr. 7'.

Quibus omnibus notis, porrò dico per ax. 3.

74. 7. 26. 2.

Ut PH, 105. 53. ad PTH, 153. 58. ita TH, 84. gr. 50'.

96180. 43889. 99594.

Ad 45446. sinum anguli HPT, cujus mensura est arcus NA, 27. gr. 2'. cujus compl. EN, 62. grad. 58'. est ascensio recta stellæ quæsita. At Raijmarus scribit, ejusdem stellæ ascensionem rectam Casellis eodem anno observatam & inventam esse 63. gr. 10'. Quæ observatio, si rectè à Raijmaro annotata est,

eſt, longitu[illegible] latitudo oculi tauri, tàm apud Ptolomeum, quàm apud Copernicum eſt mendoſa.

Denique pro inveniendo medio cœli EM,
dico per ax. 2.

Ut FA 90 gr. ad AN, 27. gr. 2′.	ita FB, 66. 32. compl. AB.	
100000.	tang. 51026.	Sin. 91729.

Ad 46805, tangentem arcus MB, 25. grad. 5′. cujus complementũ EM, eſt medium cœli ſtellæ H quæſitum 64. gr. 55′.

PROBLEMA DECIMUM SEXTUM.

Obſervata altitudine Solis, quovis diei tempore, horam invenire: ſi modo de elevatione poli, & de loco ac declinatione Solis prius conſtiterit.

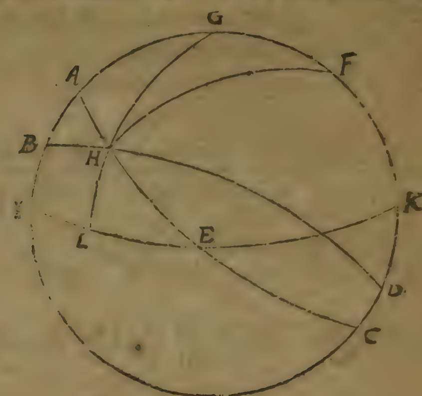
Hoc Problema in priore editione omiſi: quod ex Problemate octavo ſponte conſequi, & ſatis perſpicuè in eo contineri videretur. Nunc addo: quia addendum fuiſſe, amici quidam cenſuerunt. Habet autem tres caſus, ut Problema octavum: cujus eſt inverſio.

CASUS PRIMUS.

Si Sol ſit in Æquatore, hoc eſt, in principio arietis, vel libræ.

Sit Sol in principio libræ, ad punctum H. Et ſit obſervata ejus altitudo ſupra horizontem HL, 34. grad. 9′. 27″. Quæratur autem, quota ſit hora diei, hoc eſt, quotus ſit arcus AH, vel angulus AFH, quo arcu vel angulo Sol tunc diſtat à meridie. Quia nota præſupponitur elevatio poli FK, 49 gr. 35′. ideo nota etiam eſt altitudo Æquatoris ſupra horizontem IA: æqualis complemento elevationis poli FG, 40. gr. 25. Atq; adeo in triangulo Sphærico HEL, tria nota ſunt, nempe rectus ad L,

 per



per 57. p. 1. & acutus ad E, cujus menſura eſt arcus IA: complementum elevationis poli: & denique latus HL, altitudo Solis. Dico igitur, vel per ax. 1. Sphæricorum.

Ut IA, 40. grad. 25'. ad AE, 90. gr. ita HL, 34. grad. 9'. 27".

Sin. 64834.	Rad. 100000.	Sin. 56148.

Ad 86602, ſinum arcus HE, 60. gr. cujus complementum eſt arcus AH, 30. gr. qui oſtendit ſolem duabus horis diſtare à meridie: hoc eſt, eſſe, vel decimam antemeridianam, ſi altitudo ſolis creſcat: vel ſecundam pomeridianam: ſi altitudo Solis decreſcat, vel, per axioma 3. Sphær.

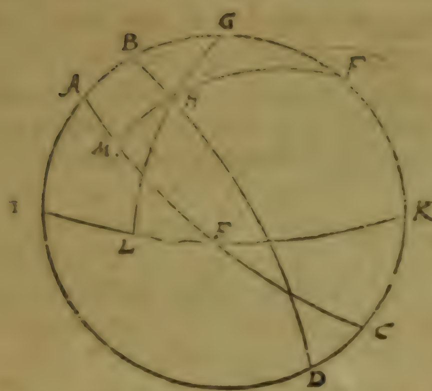
Ut HEL, 64834, ad HL, 56148, ita HLE, 100000, ad HE, 86602, &c.

CASUS SECUNDUS.

Si Sol ſit in aliquo ſigno boreo.

Sit Sol in 15. gr. Tauri: ad punctum H. Et ſit obſervata ejus altitudo ſupra horizontem, HL, 48 gr. 41'. 33". Quæratur autem quota ſit hora diei, hoc eſt quotus ſit arcus AM, vel angulus AFM, quo arcu, vel angulo Sol tunc à meridie diſtat.

Quia



Quia nota præſupponitur elevatio poli FK, 49. gr. 35. notum etiam eſt complementum elevationis poli FG, 40. gr. 25′. Quia item nota præſupponitur declinatio Solis HM, 16. gr. 21′. notum etiam eſt complementum declinationis Solis HF, 73. gr. 39′. Quia denique obſervata eſt altitudo Solis HL, 48. gr. 41′. 33″. notum etiam eſt altitudinis illius complementum GH, 41. gr. 18′. 27″. Atq; adeo in triangulo obliquangulo GHF omnia tria latera nota ſunt. Inquiro igitur angulum deſideratum GFH, per ax. 4. Sphær. & per tertium Schema illius axiomatis, hoc modo.

GF, in 3. Schem. 4. ax. AB, 40. gr. 25′. GN, 40. gr. 25′.
FH, in 3. Sch. 4. ax. BC, vel BF, 73. 39. GD, 16. 21.

AF, 114. 4. DN, 16. 46. DP, 83644.
Exc. QF, 24. 4. — VF, vel PR, 40780.

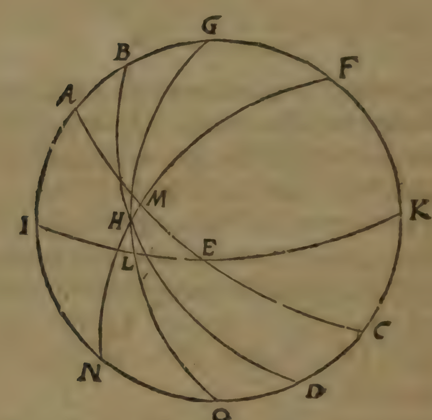
DK. 124424
DT, 62212.
GH, in 3. Sch. 4. ax. AC, DP 83644.
Compl. CS, 48. 41. 33. LP, 75100.

DL, 8315.

Ut DT, 61212, ad DE, 100000, ita DL, 8335, ad DC, 13398, ſinum verſum diſtantiæ Solis à meridie: qui detractus de radio DE, 100000, relinquit ſinum rectum complementi diſtantiæ Solis à meridie, CE, 86602, cui ſinui competit arcus, vel angulus 60. gr. Ergo diſtantia Solis à meridie eſt 30. gr.

CASUS TERTIUS.

Si Sol ſit in ſigno aliquo auſtrali.



Sit Sol in principio Scorpii: ad punctum H. Et ſit obſervata ejus altitudo ſupra horizontem, HL, 23. gr. 30'. 45''. Quæratur autem, quota ſit hora diei, hoc eſt, quotus ſit arcus AM, ſive angulus AFM, quo arcu, vel angulo Sol tunc à meridie diſtat.

Quia nota præſupponitur elevatio poli FK, 49. gr. 35'. notum etiam eſt ejus complementum FG, vel NO. 40. grad. 25'. Quia item nota præſupponitur declinatio Solis HM, 11. grad. 29'. no-

29′. notum etiam eſt ejus complementum HN, 78 gr. 31′. vel arcus HF, ex declinatione Solis HM & quadrante FM, compoſitus 101.gr.29′. Quia deniq; nota eſt ex obſervatione, altitudo Solis HL,23. gr. 30′.45″. notum etiam eſt ejus complementum, HG,66.gr. 29′.15″. vel arcus HO,ex altitudine Solis HL, & quadrante LO,compoſitus,113. gr. 30′. 45″. Atque adeo, tàm in triangulo obliquangulo FGH, quàm in triangulo obliquangulo HNO,omnia tria latera nota ſunt. Quæritur autem, vel angulus GFH,in triangulo FGH: vel angulus ANM, complementum anguli HNO,in triangulo HNO,ſive,quod idem eſt, arcus AM,qui tàm angulum ANM,quàm angulum AFM, metitur.

Porrò, triangulum FGH, ad 4. axioma triãgulorum Sphæricorum (ſecundum noſtram quidem reſtrictionem) non cõgruit: quia latus alterum ex iis, quæ angulum quæſitum includunt,nempe latus FH,eſt quadrante majus.

Solvo igitur triangulum HNO, utq; ſolutio illa congruat ad tertium ſchema 4.axiomatis,inverto hoc præſens ſchema & fingo Zenith eſſe ad punctum O,atq; ita procedo.

NO,in 3.Sch. 4.ax. AB, — 40.gr.25′.GN,40.gr.25′.
HN,in 3.Sch.4.ax.BC,vel BF,78. 31.GD,11. 29.

AF, — 118. 56.DN,51. 54.DP,78693.
Exc.QF, 28. 56. VF, vel PR, 48379.

DR, 127072.
DT, 63536.

HO, in 3.Sch. 4. axiomatis Aq. Cujus exceſſus ſupra quadrantem,hic HL,ibi Sq 23 gr.30′.45″.Sin.Pg.39866.

Dp 78693.

Dg.118559.

Ut DT, 63536, ad DE, 100000, ita Dg, 118559, ad Dh, 186601, ſinum verſum anguli obtuſi, in præſente ſchemate per literas HNO, notati: de quo ſinu verſo Dh, 186601, detractus radius DE, 100000, relinquit ſinum rectum exceſſus ſupra quadrantem, Eh, 86601, cui ſinui reſpondet arcus, vel angulus 60. grad. Ergo obtuſus HNO, eſt major recto, 60. gradibus: & per conſequens, acutus HNI, reliquus ad duos rectos juxta punctum N, eſt 30. grad. atque adeo diſtantia Solis à meridie eſt duarum horarum. Quod oſtendendum erat.

BAR-

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Grunbergensis

PROBLEMATUM ASTRONOMICORVM

LIBER SECUNDUS,

De motu trepidationis itidem stellarum omnium communi,

Sive

De diversitate obliquitatis Signiferi.

PROTHEORIA.

Sit colurus solstitiorum ABCD, & in eo poli Æquatoris F, & G, poli Signiferi H, & I, Signifer ipse BKDL. Æquator AKCI, Axis Signiferi HEI, axis Æquatoris FEG. Deinde in coluro solstitiorum assumatur arcus MHQ, tantus, quanta est differentia inter maximam obliquitatem Signiferi FM, & inter minimam FQ, per hunc arcum MHQ, axis Signiferi & cum eo tota cœlorum machina hinc inde movetur ab M, per H, in Q, & rursus a Q, per H, in M, idque motu admodum inæquali: nempe circa maximam & minimam Signi-

Signiferi obliquitatem tardissimo, circa mediam, velocissimo: ut multorum seculorum observationes ostendunt. Iam motus inæqualis, nisi mediante aliquo motu æquali ad calculum revocari non potest. Polo igitur mediæ obliquitatis Signiferi H, intervallo dimidiæ differentiæ HQ, vel HM, describatur in superficie globi epicyclus MNOP. Et in eo anomalia, sive diversitas obliquitatis Signiferi æqualiter moveri intelligatur ab M, in N, &c. quo facto, manifestum est, motui fictitio æquali per circumferentiam epicycli MNOP, respondere motum verum per diametrum MHQ, admodum inæqualem: & quidem omnino talem qualem observationes requirunt: nempe circa M, & Q. tardissimum, circa H, velocissimum. Sint enim æquales arcus MN, OP, PY & VQ, nempe singuli 5. graduum. Manifestum est portiones diametri MHQ, illis arcubus respondentes nempe rectas, vel quasi rectas MT, SH, HZ, & XQ, admodum esse inæquales, MT, enim XQ, sunt sinus versi: SH, verò & HZ, sunt sinus recti, eorundem arcuum. Iam sinus versus 5. graduum non est nisi 381. sinus

381. sinus verò rectus est 8715. Atqui 381. in 8715. plusquam vicies continetur. Ergo motus circa extremitates M & Q, (hoc est, circa maximam & minimam obliquitatem Signiferi) plusquam vigecuplo tardior est motu circa H. Quod ante omnia ostendendum erat.

PROBLEMA PRIMUM.

Æqualem motum anomaliæ obliquitatis Signiferi ad quodvis datum tempus colligere.

Ad omnem æqualem motum colligendum, etiam tempus datum æquale sit oportet. Inæquales autem sunt anni Iuliani: quippe alii dierum 365. alii dierum 366. Inæquales etiam sunt menses Iuliani: quippe alii dierum 30. alii dierum 31. alii dierum 28. vel 29. Inæquales deniq; sunt etiam dies civiles: propter duas causas. Primùm, quia motus Solis in Signifero est inæqualis. Deinde, quia etiam cum æqualibus arcubus Signiferi, inæquales arcus æquatoris ascendunt. Dies autem civilis est revolutio totius Æquatoris, & insuper particulæ tantæ, quanta cum eo arcu Signiferi, quem interim Sol proprio & contrario motu emensus est, ascendit. Sed inæqualitas quidem dierum civilium nisi in motu Lunæ, nihil habet momenti: nec nisi absoluto calculo motus Solis intelligi potest. Ergo ejus correctio sub finem problematum de motu Solis differatur. Inæqualitas autem annorum Iulianorum corrigitur, reductione eorum ad annos Ægyptios, qui perpetuo sunt æquales: quippe singuli dierum 365. Cæterum, anni Iuliani ad annos Ægyptios reducuntur, si per 4. dividantur. Sic enim quarti cujusq; anni dies intercalaris separatur: & in unoquoque anno non nisi 365. dies relinquuntur. Mensium autem Iulianorum inæqualitas evitatur, dum pro mensibus datis, dies

illorum mensium ad calculum assumuntur. Exempli causa, sit quærendus aliquis motus æqualis ad horam secundam pomeridianam diei 30. Iunii, anni à N.C. 1600.

Primum annos Iulianos completos 1599. reduco ad annos Ægyptios hoc modo:

~~333.~~ — anni tres, post bissextilem reliqui.
~~1599.~~
~~444.~~ (399. dies intercalares.
365. (1. annus Ægyptius, ad 1599. addendus.
34. --- dies residui.

Deinde numero dies mensium dati anni currentis 1600. & sunt, dies Ianuarii — 31.

sunt, dies Ianuarii	—	31.
Februarii	—	29.
Martii	—	31.
Aprilis	—	30.
Maii	— —	31.
Iunii, dies completi		29.
Dies antea residui		34.
Summa dierum.		215.

Quia annus Iulianus 1600. est bissextilis: quippe cum annus 1599. fuerit tertius post bissextilem: idq; ideo, quia annus NC. fuit bissextilis. Ergo & quartus quisq; ab illo est bissextilis.

Deniq; horis duabus pomeridianis addo horas 12. à media nocte elapsas, ut fiant horæ 14 idq; propterea, quia Copernicus æram Christi orditur, non à meridie Calendarum Ianuarii: sed à media nocte Calendas Ianuarias antecedente: idq; respectu meridiani Cracoviensis, cujus longitudo secundum Copernicum est 45. graduum 30. minutorum.

His ita factis, tempus calculo Astronomico aptum est
annorum Ægyptiorum. 1600.
Dierum. — — 215.
Et horarum. — — 14.

Quos annos & dies compendiosioris calculi causa redigo in Sexagenas annorum & dierum: horas verò converto in scrupula, sive in sexagesimas partes dierum: hoc modo.

44
1600
660 (26. Sexagenæ annorum, & 40. anni.
6
3
215
60 (3. Sexagenæ dierum, & 35. dies.

24. horæ dant 60. ſcrupula dierum, quot ſcrupula dierum dant 14. horæ?

℞. 35. Nam

Ut 24 ad 60, ita 14.

2. 5. 7.

1. ad 35.

¶ Præter temporis correctionem in omni motu æquali colligendo hæc duo præſcire oportet.

Primum, quanto tempore abſolvatur ille motus.

Alterum, conſtituto certo aliquo temporis principio, quouſq; tunc & unde progreſſus fuerit ille motus. Verbi gratia: quouſq; & unde progreſſus fuerit motus anomaliæ obliquitatis Signiferi, tempore nativitatis Chriſti.

Ad primam quæſtionem hoc loco reſpondet Copernicus, motum anomaliæ obliquitatis Signiferi (ipſe vocat motum anomaliæ ſimplicis Æquinoctiorum) abſolvi annis Ægyptiis 3434. Idq; probabiliter colligit ex obſervationibus antiquis ac novis, lib. 3. cap. 6.

Motus igitur annuus eſt — $6'.17''.24'''.9''''$. ferè

Motus diurnus — $0'.1''.2'''.2''''$. Nam

I. Ut 3434. anni ad 360. grad. ita 1. annus ad 0. grad. $6'.17''.24'''.9''''$. ferè.

II. Ut 365. dies ad $6'.17''.24'''.9''''$. ita 1. dies ad $0',1''.2''',2''''$.

Quia verò motus unius anni eſt 6'.17''.24'''.9''''. ideo motus Sexaginta annorum, ſive unius Sexagenæ annorum eſt 6. gr. 17'.24''.9'''. Nam ut anni per 60. creſcunt: ita motus.

Stifelius eandem artem expoſuit lib. 1. Arithmet. lat. cap. 10. fol. 83. facie 6. & ſeqq.

Eodemq; modo: quia unius diei motus eſt 1''. 2'''. 2''''. ideo ſexaginta dierum, ſive unius ſexagenæ dierum motus eſt 1'. 2''. 2'''. Quod obſervare operæprecium eſt: quia calculum præbet admodum facilem ijs: qui practicam Italicam norunt: quam Studioſus mathematum ignorare nemo debet. Diſcere autem poterit, qui volet, ex Arithmetica Germanica Petri Apiani: vel ex aliis id genus libellis: qui vulgò proſtant, & in omnium ferè mercatorum manibus verſantur.

Ad ſecundam quæſtionem reſpondet, & rurſus ex obſervationibus antiquis atq; novis probabiliter colligit Copernicus, motum anomaliæ obliquitatis Signiferi ab M, verſus N, hoc eſt, à maxima obliquitate verſus minimam tempore nativitatis Chriſti, progreſſum eſſe gradibus 6, min. 45.

Quibus ita poſitis: æqualem motum anomaliæ obliquitatis Signiferi ita colligo, ut ſequitur.

		Sex, annorum.		Sexag. anni.
1.	—	6. gr. 17'. 24''. 9'''.	—	26. 40.
	2.	5. 48. 3. 0.		20. 20.
		31. 27. 0. 45.		5. 20.
		4. 11. 36. 6.		1.
	2.	47. 44. 4. 0.		

Sex.

Sex dierum.				Sex.dies.ſcr.
1.	—	1'.2''.2'''.	—	3.35 35.
				7.11.10.
				7.11.10.
Motus dierum		—		3'.42''.53''',21'''',10'''''.
Motus annorum		2. Sex. 47. gr.		44.4.
Radix.	—	0. 6.		45.
Summa	—	2'. 54. grad.		32'.46''.53''',21'''',10'''''.

Hoc eſt

174.grad. 32'. ferè.

Nam duæ ſexagenæ graduum ſunt 120. gr. quibus ſi addas 54.gr. efficiuntur 174. gr. &c.

PROBLEMA SECUNDUM.

Proſtaphæreſes obliquitatis Signiferi ſupputare.

Proſthaphæreſes obliquitatis Signiferi ſunt portiones diametri MHQ, inæquales, arcubus anomaliæ MNOP æqualibus reſpondentes: & ideo ſic dicuntur, quia modo addendæ ſunt ad obliquitatem Signiferi mediam, modo ab eadem auferendæ: prout citra, vel ultra mediam obliquitatem Signiferi H, conſiſtunt.

Supputantur autem adminiculo ſinuum, ſi prius conſtet quantitas diametri MHQ, nempe differentia inter maximã & minimam obliquitatem Signiferi, quam differentiam Copernicus dicit & probat eſſe 24. ſcr. primorum, lib. 3. cap. 10. Tempore enim Ptolemæi, cum motus eſſet tardiſſimus, & ferè imperceptibilis, erat obliquitas Signiferi 23. grad. 52'. ferè. Nunc quando motus iterum eſt tardiſſimus, & ferè imperce-

 ptibilis,

prcibilis, obliquitas Signiferi per obſervationes deprehenditur non multò major, quam 23. gr. 28′. Unde liquet iſtos duos eſſe ſummæ tarditatis limites. Subtractis autem FQ, 23. gr. 28′. de FM, 23. gr. 52′. relinquuntur QM, 24. ſcrupula prima. Quibus datis, quia ad datum tempus motus anomaliæ MV, 174. gr. 33′. exceſſit quadrantem MP, arcu PV, 84. gr. 33′. cujus arcus ſinus HX, eſt 99547. ideo dico:

Ut HQ, 100000, ad HX, 99547, ita QH, 12′.

12	ad HX, 11′. 56″. qui-
199094	bus ſubtractis de me-
99547	dia obliquitate Signi-
11 | 94564	feri FH, 23. gr. 40′. re-
60	ſtat obliquitas quæſita
56 | 73840	FX, 23. gr. 28′. 4″.

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Grunbergensis

PROBLEMATUM
ASTRONOMICORUM

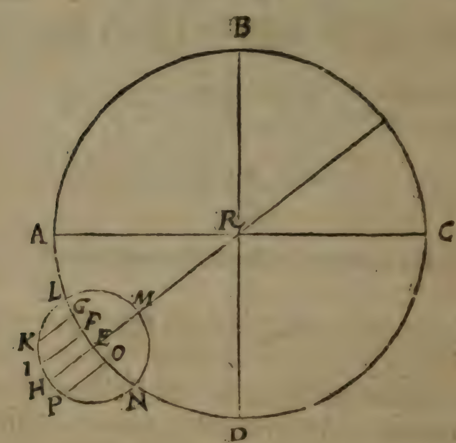
LIBER TERTIUS.

De motu fixarum proprio,
Sive
De motu præcessionis Æquinoctiorum.

PROTHEORIA.

ÆQuinoctia ad primam Arietis stellam fixa esse veteres crediderunt. At inde dimoveri & quotannis nonnihil anticipare tempus docuit. Unde verisimile est, fixas secundum signorum ordinem ab occasu in ortum circa axem Signiferi in morem planetarum circumagi. Quia verò perinde est, sive prima stella Arietis unà cum tota stellarum fixarum sphæra à puncto æquinoctii verni antrorsum: (hoc est, secundum signorum ordinem) sive punctum æquinoctii verni à prima stella Arietis retrorsum (hoc est, contra signorum ordinem) moveatur: Copernicus autem omnes motus à prima stella Arietis deducit: etiam nos punctum æquinoctii verni

verni à prima ſtella Arietis tanquam fixa & immobili retro per Signiferum moveri nunc fingemus. Qua fictione aſſumta, ſit Signifer ABCD, prima ſtella Arietis, & quondam punctum æquinoctii verni A, atque tunc punctum ſolſtitii æſtivi, ſive principium Cancri B. Ab illo puncto A, ſive à prima ſtella arietis ibi fixa, punctum æquinoctii verni ſubinde magis magiſque retrocedit: & quidem motu inæquali. Qui motus inæqualis, ut ad calculum revocari poſſit, fingatur motus qui-



dam præceſſionis Æquinoctiorum medius & æqualis, ab A, in E, deinde polo E, in ſuperficie globi, ad Signiferum ABCD aſcribatur epicyclus HIKL, diametro tanta, quanta eſt maxima differentia inter fictitium æqualem, & apparentem inæqualem præceſſionis Æquinoctiorum motum. In cujus epicycli circumferentia HIK, motus anomaliæ circumcurrat: proſthaphæreſes autem, à motu æquali E, in primo ſemicirculo HLM, auferendæ: in poſteriore ſemicirculo HLM, auferendæ: in poſteriore ſemicirculo MNH, ad eundem motum

tum æqualem addendæ in diametro NEL, æſtimentur: ut ſupra in obliquitate Signiferi factum fuit. His ita poſitis jam tria quæruntur. 1. quantus ſit motus æqualis præceſſionis æquinoctiorum, ſive quantum proceſſerit punctum E à puncto A, unoquoq; tempore 2. quantus ſit motus æqualis anomaliæ præceſſionis Æquinoctiorum, ſive quantum proceſſerit punctum H, verſus I, unoquoque tempore, 3. quæ proſthaphæreſis in diametro epicyli NEL, reſpondeat motui anomaliæ per circumferentiam epicycli HIK.

PROBLEMA PRIMUM.

Æqualem motum præceſſionis Æquinoctiorum ad quodvis datum tempus colligere.

Supra diximus, ad quemvis motum æqualem pro tempore dato colligendum duo præſciri oportere.

1. Quanto tempore abſolvatur ille motus: atque adeo, quantus ſit motus annuus ac diurnus.

2. Quouſq; & unde progreſſus fuerit ille motus certo quodam tempore, verbi gratia, tempore Nativitatis Chriſti.

De primo, hic reſpondet Copernicus, æqualem motum præceſſionis Æquinoctiorum abſolvi annis Ægyptiis 25816, idque per diverſorum temporum obſervationes probat, lib. 3. cap. 6.

Unde liquet, motum annuum eſſe. 50″. 12‴. 5⁗.
diurnum: 0″. 8‴. 15⁗.

Nam, ut 25816. anni ad 360. grad. ita 1, annus
ad 0. gr. 0′. 50″. 12‴. 5⁗. Et

Ut 365. dies ad 50″. 12‴. 5⁗. ita 1, dies
ad 0″. 8‴. 15⁗.

De ſecundo, reſpondet Copernicus, æqualem motum præceſſionis Æquinoctiorum tempore nativitatis Christi progreſſum eſſe ab A, verſus E, 5. gr. 32′.

Hinc pro tempore dato colligitur motus æqualis præceſſionis Æquinoctiorum hoc modo:

Sex. an.		Sex anni.
1. —	$50'.12''.5'''$. —	26. 40.
	30.	13. gr. 20′.
	20.	8. 53. 20.
		5. 20.
		2. 13. 20.
		$22.gr.18'.42''.13'''.20''''$.

Sex d.		Sex. d. ſer.
1. — —	$8''.15'''$. —	3. 35. 35.
	24. 45.	30. 30.
	4. 7. 30.	5. 5.
	41. 15.	
	4. 7. 30.	
	41. 15.	

$0'.\ 29''.\ 38'''.\ 33''''.\ 45'''''$.	Motus dierum.
22. 18′. 42. 13. 20.	Motus annorum.
5. 32.	Radix.
$27.gr.51'.11''.\ 51'''.\ 53''''.\ 45'''''$.	Summa.

PROBLEMA SECUNDUM.

Æqualem motum anomaliæ præceſſionis Æquinoctiorum ad quodvis datum tempus intelligere.

Æqualis motus anomaliæ præceſſionis Æquinoctiorum duplus eſt ad æqualem motum anomaliæ obliquitatis Signiferi, ut oſtendit Copernicus lib. 3. c. 6.

Ergo

Ergo, si æqualem motum anomaliæ obliquitatis Signiferi, supra inventum, duplices, habebis æqualem motum anomaliæ præcessionis æquinoctiorũ, ad tempus datum: hoc modo:

174. gr. 33′. Anom. obl. Signiferi.
2.

349. 6. Anom. præcel. Æq.

Initium autem sumit motus anomaliæ præcessionis Æquinoctiorum, à linea medii motus, nempe à puncto H, & tendit in partem medio motui contrariam, nempe versus I & K.

Quo posito, ad tempus datum anomalia præcessionis æquinoctiorum progressa erit ab H, per L, M & N, usque ad P, & restabit de toto circulo tantum arcus PH.

PROBLEMA TERTIUM.

Prosthaphæreses præcessionis Æquinoctiorum supputare.

Hîc ante omnia sciendum est, quanta sit maxima prosthaphæresis, sive quanta sit maxima differentia inter æqualem & apparentem motum præcessionis Æquinoctiorum, hoc est, quanta sit semidimetiens epicycli HIK, per quem circumit anomaliæ motus. Copernicus dicit, & ex observationibus probat, esse septuaginta scrupulorum primorum, lib.3.c.7.

Quo posito & concesso, reliquæ differentiæ sive prosthaphæreses ad quemvis datum anomaliæ motum æqualẽ prorsus eodem modo, quo prosthaphæreses obliquitatis Signiferi colliguntur.

EXEMPLI GRATIA. Ad datum anomaliæ motum æqualem 349. gr. 6′. cujus motus complementum ad integrum circulum est PH, 10. gr. 54′. prosthaphæresis ita colligitur:

Ut EN, radius ad EO, sinum rectum 10. gr. 54'. ita EN.

100000. 18909. 70. scr. prima.

70.

13|23630.

60.

14|17800.

ad EO, |13'. 14".

Jam EO, consistit ultra medium, sive æqualẽ motum præcessionis Æquinoctiorum, nempe ultra lineam RE. Ergo prosthaphæresis est ad medium motum AE, addenda, hoc modo:

AE.	27. gr.	51'.	12".	Medius motus.
EO.	0.	13.	14.	Prostaphæresis.
	28. gr.	4.	26.	Vera præcessio Æq.

PROBLEMA QUARTUM.

Motum fixarum, sive præcessionem Æquinoctiorum ex observationibus deprehendere.

Fit hoc per problema 14. libri primi. Exemplum vide apud Copernicum lib. 3, c. 2.

BAR-

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PROBLEMATUM ASTRONOMICORVM

LIBER QUARTUS.

De motu Solis proprio.

PROTHEORIA.

SOL proprio motu ſub Ecliptica fertur ab occaſu in ortum, & annuo ſpacio ſemel circumvolvitur. Sed diutius immoratur in ſignis boreis, quàm in auſtrinis. Quod argumento eſt, centrum revolutionis ejus eſſe à centro mundi diverſum. Sed & apogeum Solis ſecundum ordinem ſignorum quotannis nonnihil progreditur. Quod indicio eſt, etiam centrum eccentrici Solis eodem modo circa terram circumire. Nam centrum eccentrici & apogeum ſemper & neceſſariò ſunt in eadem linea: unde moto apogeo, etiam centrum eccentrici movetur, & contra. Verùm, nec apogei motus eſt æqualis: ſed aliquando tardior, aliquãdo velocior. Unde colligere promptum eſt, etiam centrum eccentrici Solis ferri in eccentrico, vel certe in concentri epicyclo. Quæ opinio etiam inde confirmatur, quia eccentricitas Solis inæqualiter jam diu decrevit: quomodo omnino decreſceret, ſi centrum eccentrici in

epicyclo quodam ad terram modo propius advolveretur, modo longius ab ea retrocederet. Sit ergo Ecliptica ABCD, deſcripta ex centro mundi E, & ſint in ea quatuor cardines ſuis ſignis notati ♈, ♋, ♎, ♑. Prima autem ſtella Arietis ſit ad F. Unde hoc noſtro tempore punctum æquinoctij verni retroceſſerit uſque ad ♈, ut præceſſio æquinoctiorũ ſit F, ♈. Apogeum verò medium hoc noſtro tempore proceſſerit ab F, in G, ſimiliterq; centrum eccentrici medium I, ab H, in I, centrum autem eccentrici verum poſt tres integras revolutiones interim contrario motu pervenerit à K, per M, in L, quo

quo L, centro deſcribatur eccentricus Solis NOP, & per duo centra E & L, ducatur recta BLED, qua ducta erit apogeum Solis verum in B, differens ab apogeo medio G, angulo BEG, qui angulus, quia citra lineam apogei medii GIE, ſubſiſtit, ideo eſt à motu apogei medii auferendus. Si autem ultra lineam medii motus GIE, conſiſteret (ut futurum eſt, quando centrum eccentrici decurret in ſemicirculo epicycli poſteriore) eſſet ad eundem medium motum addendus. Angulus igitur BEG, vel LEI, eſt proſthaphæreſis centri eccentrici. Eccentricitas autem eſt LE, nunc ferè minima: quæ tempore Ptolemæi erat ferè maxima, quaſi ME. Porrò, Sol ab apogeo N, verſus perigeum R, progreſſus ſit motu æquali uſque ad O, hoc eſt, diſtet ab apogeo ſuo, angulo NLO: ſpectetur autem ex centro mundi E, manifeſtum eſt angulum apparentiæ NEO, angulo medii motus NLO, longè eſſe minorem. Nam in Triangulo LEO, angulus exterior NLO, ſolus tantus eſt, quanti ſunt ambo interiores oppoſiti LEO & EOL, ſimul ſumti: per 48.p.1. Et per eandem, angulus EOL, ſubtractus ab angulo LNO, relinquit angulum NEO. Angulus igitur EOL, eſt proſthaphæreſis Solis ad O, conſiſtentis: eodemq; modo anguli LPE, LQE, LRE. LSE, LTE, LVE, ſunt proſthaphæreſes Solis ad P, vel Q, vel R, &c. conſiſtentis. Quæ proſthaphæreſes in priore ſemicirculo, nempe ab apogeo ad perigeum ſemper ſunt à medio, ſive æquali motu Solis auferendæ: in poſteriore ſemicirculo, nempe à perigeo ad apogeum, ſemper ſunt addendæ. Nam in priore ſemicirculo, nempe in ſemicirculo NPR, angulus apparentiæ angulo medii motus ſemper eſt minor, ut angulus NEO, eſt minor angulo NLO: angulus NEP, eſt minor angulo NLP, angulus NEQ, eſt minor angulo NLQ. In poſteriore verò ſemicirculo, nempe in ſemicirculo RTN, angulus apparentiæ angulo medii motus ſemper eſt major: ut angulus RES, eſt major an-

jor angulo RLS: angulus RET, est major angulo RLT: angulus REV, est major angulo RLV. Maximæ autem prosthaphæreses utrinq; sunt in media apparentia inter apogeum & perigeũ, nempe ad P, & T: minimæ, circa apogeum & perigeum; nullæ in ipso apogeo, vel perigeo. Et motus quidem circa apogeum apparet tardissimus: circa perigeum velocissimus, eandem ob causam: quia nempe angulus apparentiæ hinc inde ab apogeo semper est justo minor, at hinc inde à perigeo semper est justo major. Hinc morale illud: Sol quando est altissimus, lentissimo & quasi modestissimo gradu incedit: ita homines decet. Hac theoria præmissa, jam facilè erit sequentia problemata intelligere.

PROBLEMA PRIMUM.

Æqualem, sive medium motum Solis à prima stella Arietis ad quodcunq; datum tempus invenire. Coper. lib. 3. cap. 14.

Æqualis motus Solis in eccentrico ZVN, à prima stella Arietis Z, (Nam anguli FEB, & ZLN, sunt iidem) vicissim ad eandem absolvitur secundum Copernicum diebus 365. scrupulis 15'. 24''. 10'''.

Hinc patet motus Solis annuus: 5^s. 59. gr. 44'. 49''. 7'''. 4''''.
ac diurnus 0. 0. 59. 8. 11. 22.

Nam, ut 365. dies 15'. 24''. 10'''. ad 360. grad. ita 365. dies
ad 359. gr. 44'. 49''. 7'''. 4''''.
Sive quod idem est,
ad 5^s. 59. gr. 44'. 49''. 7'''. 4''''. Et
Ut 365. dies ad 5^s. 59. gr. 44'. 49''. 7'''. 4''''. ita 1. dies
ad 0. Sex. 0. gr. 59'. 8''. 11'''. 22''''.

(Tycho Brahe motum Solis diurnum statuit esse 0. gr. 59'. 8''. 19'''. 43''''$\frac{2}{3}$. Progym. pag. 13.

Notis

Notis autem motibus unius anni ac diei, noti etiam sunt motus 60 annorum, vel dierum: nempe

Motus sexagenæ annorum 5ˢ. 59ˢ. 44. gr. 49′. 7″. 4‴.

Motus sexagenæ dierum. 0. 0. 59. gr. 8′. 11″. 22‴.

Hæc periodus est motus Solaris. Locus autem illius motus, sive progressio Solis à Z, versus N, tempore NC, fuit 4. gr. 32′. 30″.

Quibus duobus ita positis, ad tempus supra datum medius motus Solis per compendiũ practæ Italicæ colligitur modo:

	Sex. an.		Sex. anni.
	1. —	5ˢ. 59ˢ. 44. gr. 49′. 7″. 4‴. —	26. 40.
	1. 59. 54. 56.	22. 21. 20.	20. 20.
Rejectis inte-	29. 58. 44.	5. 35. 20.	5. 20.
gris circulis	3. 59. 49.	52. 44. 43.	1.
Summa est	5. 15.	9. 48. 26.	

Sex. d.		Sex. dies. scr.
1. —	59. gr. 8′. 11″. 22‴. —	3. 35. 35.
2.	57. 24. 34. 6.	30. 30.
	29. 34. 5. 41.	5. 5.
	4. 55. 40. 56. 50.	
	29. 34. 5. 41.	
	4. 55. 40. 56. 50.	

3. 32. 28. 50. 30. 27. 50. Motus dierum.

5. 15. 9. 48. 26. Motus annorum.

4. 32. 30. Radix.

1. Sex. 20. gr. 8′. 38″. 56‴. 27⁗. 50. Motus æqualis Solis à prima stella Arietis: quem Copernicus vocat motum Solis æqualem simplicem: cui si

addideris præcessionem Æquinoctiorum æqualem, 27. gr. 51'. 11''. 40'''. 47''''. habebis motum Solis æqualē compositum, ad tempus supra datum:

1. Sex. 47. gr. 59'. 50''. 37'''. 14''''. 50'''''.

PROBLEMA SECUNDUM.

Æqualem motum apogei, sive centri eccentrici Solis ad quodvis datum tempus intelligere. Cop. lib. 3. c. 22.

Annuus motus apogei Solis secundum

Copernicum est	—	24''. 20'''. 14''''.
Motus diurnus	—	0''. 4'''. 0''''.

Locus autem medii motus apogei Solis, à prima stella Arietis tempore N. C. fuit 61. gr. 18'. 40''. 15'''. 24''''.

Hinc ad tempus supra datum medius motus apogei sive centri eccentrici Solis colligitur hoc modo.

Sex. anni.					Sex. anni.
1.	—	—	24'. 20''. 14'''.	—	26. 40.
	8.	6.	44 40.		20. 20.
	2.	1.	41. 10.		5. 20.
	0.	16.	13. 29. 20.		1.

10. grad. 48'. 59''. 33'''. 20''''.

Sex. d.				Sex. dies. ser.
1.	—	— 4''.	—	3. 35. 35.
		12.		30. 30.
		2. 20.		5. 5.
		2. 20.		
		— 14''. 22'''. 20''''.		Motus dierum.

10. gr.

10.gr.45'.59".33'''.20''''.	Motus annorum.
61. 18. 46. 15. 24.	Radix.
72.gr. 8. 0. 11. 4.	Summa. Medius

motus apogei Solis ad tempus ſupra datum.

PROBLEMA TERTIUM.

Æqualem motum anomaliæ apogei Solis ad quodcunq; datum tempus indagare.

Æqualis motus anomaliæ apogei eſt æqualis motus centri eccentrici Solis in epicyclo KML, tendens à K, verſus M.

Statuit autem Copernicus motum illum per omnia convenire cum æquali motu anomaliæ obliquitatis Signiferi. Iam, æqualis motus anomaliæ obliquitatis Signiferi ad tempus ſupra datum erat 174.gr.33'.

Ergo etiam æqualis motus centri eccentrici ad tempus ſupra datum eſt, *174* grad.*33*'. Atque adeo ad illud tempus centrum eccentrici Solis progreſſum erit in epicyclo ſuo à K per M, uſque ad L.

PROBLEMA QUARTUM.

Proſthaphæreſes apogei, ſive proſthaphæreſes centri eccentrici Solis ſupputare.

Proſthaphæreſis apogei, ſive centri eccentrici Solis hîc, verbi gratia, eſt angulus LEI, ad quem inveniendum præter datum angulum LIE, (qui angulus eſt anomaliæ KL, ſive anguli KIL, 174.gr.33'. complementum ad ſemicirculum 5 gr. 27'.) duo requiruntur. 1. notitia mediæ eccentricitatis EI, 2. no-

2. notitia differentiæ inter mediam & maximam eccentricitatem IK, sive IL.

Statuit autem Copernicus maximam eccentricitatem Solis EK, esse 417. minimam EI, 323. talium partium, qualium, quæ ex centro eccentrici esset 10000. Hinc latera EI & IL, colliguntur hoc modo:

EK,	417.
EX,	323.
XK,	94.
IX, vel IL,	47.
EI,	370.

Qua collectione facta, quia jam in Triangulo EIL, tria nota sunt nempe angulus LIE, & duo latera includentia angulum notum LI, & EI. Item summa angulorum duorum ignotorum, hoc est, complementum anguli dati ad duos rectos, par angulo LIK, dato 174.33. ejusq; dimidium 87. 16½. Et deniq; summa laterum datorũ 417. & differentia eorundem 323. Dico per axioma 3. planorum.

Deinceps omnia exempla supputata sunt ad radium 10000000.

Ut summa laterum datorum. ad differ. eorundem.
417. 323.
ita tangens 87. gr. 16½.
210101183.

Ad 162740844. tangentem anguli 86. gr. 29'. 1''½. qui detractus de angulo 87. 16½. relinquit angulum minimum LEI, vel BEG, 47. 28''½. quem angulum si auferas ab angulo medii motus apogei FEG, 72. gr. 8'. relinquitur verus motus apogei Solis, ad tempus supra datum FEB, 71. gr. 20'. 31''½.

PRO-

PROBLEMA QUINTUM.

Eccentricitatem eccentrici Solis invenire.

Eccentricitas eccentrici Solis ad supra datum tempus erit recta EL.

Noti autem sunt in triangulo EIL, per problema præcedens omnes anguli, & insuper etiam duo latera EI, & IL. Dico igitur per 2. planorum.

Ut IEL, o. grad. 47''. 28½. ad IL, ita EIL, 5. grad. 27'.

Sin. 138095. 47. Sin. 949771.

Ad EL, $323\frac{34552}{138095}$.

Ergo eccentricitas Solis ad datum supra tempus erit $323\frac{34552}{138095}$. respectu radii 10000. vel, quod perinde est, 323250. respectu radii 10000000.

PROBLEMA SEXTUM.

Prosthaphæreses eccentrici Solis supputare.

Prosthaphæreses eccentrici Solis (Copernicus vocat prosthaphæreses orbis) ut in protheoria diximus, sunt exempli gratia, anguli LOE, LPE, &c. Quos angulos, ut reperias, duo requiruntur.

1. Notitia distantiæ Solis ab apogeo.
2. Notitia eccentricitatis.

Distantia Solis ab apogeo repetitur subtractione veri motus apogei à medio motu Solis: vel hujus ab illo: prout quisque illorum motuum est major, vel minor. Verbi gratia.

Ad datum supra tempus erant

Medius motus Solis. 80. gr 8'. quasi ZO.

Verus motus apogei 71. 20. quasi ZN.

Ergo distantia Solis ab apogeo N, hoc est, arcus NO, sive angulus NLO, erit 8. 48.

Eccentricitas autem EL, per problema antecedens reperta est 323250. partium, qualium LO, est 10000000.

Hinc jam in Triangulo LEO, tria nota sunt:

1. Latus LO, 10000000.
2. Latus EL, 323250 eorumque.

Summa 10323250.

& differentia 9676750.

3. Anguli ELO, complementum NLO, hoc est, summa duorum angulorum E & O, 8. gr. 48'. ejusque summæ dimidium 4. gr. 24'.

Dico igitur per axioma tert. planorum:

Ut summa laterum EL & LO, ad differentiam.

10323250. 9676750.

ita tangens 4. gr. 24'.

769458.

Ad 721270. tangentem anguli 4. gr. 7'. $31''\frac{1}{2}$. qui demtus de dimidia summa angulorum ad E & O, 4. gr. 24'. relinquit angulum minimum, sive prosthaphæresin quæsitam LOE, 0. gr. 16'. $28''\frac{1}{2}$. quæ prosthaphæresis ablata de medio motu Solis 80. gr. 8'. 39''. relinquit verum motum ☉, à prima stella Arietis 79. gr. 52'. $11''\frac{1}{2}$. Cui si addas veram præcessionem æquinoctiorū, habebis verum motum Solis ab æquinoctio verno, ad tempus supra datum, hoc modo:

Medius

Medius motus ☉.	80. 8′. 39″.
Prosthaphæ.	0. 16 28½.
Verus motus a prima.	79. 52. 11½.
Præcessio æquinoctiorum.	28. 4. 26.

Verus locus ☉, ab æq. verno 107. 56. 37½. hoc est, 17. gr. 56′. 57″½. Cancri. Ergo ad tempus supra datum, nempe Anno 1600. die 30. Iunii antiqui: horâ secunda pomeridianâ, verus locus ☉, ab æquinoctio verno erit 17. gr. 56′. 37½. Cancri.

An autem calculus iste cœlo respondeat, observare poteris, per 12. problema libri primi problematum Astronomicorum.

NOTA.

NOTA. Eædem prosthaphæreses etiam per primum axioma supputari possunt, hoc modo.

NLO, 8. gr. 48'.	—	*Sinus OP,* 1529858.
	Sinus complementi, pL	9882284.
	Latus EL.	323250.
	Ep.	10205534.

Ut Ep, 10205534. ad Op, 1529858. ita Ep, 10000000. ad Op, tangentem anguli OEp, 1499047. — 8. grad. 13'. 31"½. Qui angulus subtractus de angulo pLO, 8. gr. 48'. relinquit angulum prosthaphæreticum EOL, 0. gr. 16'. 28"½. ut ante.

PROBLEMA SEPTIMUM.

Tempus æquinoctii (& similiter ingressum Solis in quodcunq; punctum Signiferi) observare.

Duobus circa æquinoctium diebus, observa altitudinem Solis meridianam, & ex ea collige locum solis in Zodiaco per problemata 11. & 12. lib. 1.

Tum tempus inter duas istiusmodi observationes interjectum partire proportionaliter, sicut majori distantiæ à puncto æquinoctiali longius tempus conveniat: minori brevius: & habebis verum æquinoctii tempus.

EXEMPLUM. Anno 1580 observavit quidam altitudinem Solis meridianam 11. & 12. diebus Martii: & inde per problemata modo citata collegit locum distantiæ Solis à puncto Æquinoctiali: ad diem 11. Martii, citra Arietem 0. gr. 7'. ad diem 12. Martii, ultra Arietem 0. gr. 52'. Iam horæ inter istas duas observationes interjectæ erant 24. Motus autem istis 24. horis conveniens erat in summa, 59. min.

Dico

Dico igitur.

59. min. dant 24. horas: quot horas dant 7. min.

```
   7.
 168.     R.
  59. (2. H. 50'.
 118.
  50.
  60.
3000.
  59. (50'.
 295.
  50.
```

Ergo ingressus Solis in Arietē fuit 11. Martii, 2. H. 50'. P. M. Sed hoc exemplum est fictum: & scrupula secunda neglecta. In seriis autem observationibus Æquinoctiorum, quia sunt maximi momenti, etiam scrupula secunda, tertia & quarta, videntur adhibenda.

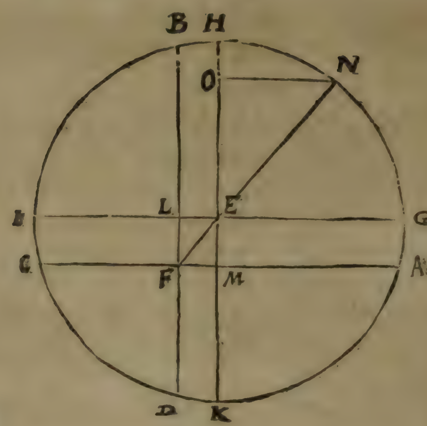
PROBLEMA OCTAVUM.

Apogei locum, & eccentricitatis quantitatem observare.

Hoc problema nobilissimum explicabo per quatuor exempla itidem nobilissima: quorum unum est Ptolemæi, alterum Copernici: tertium Tychonis Brahe: quartum Iusti Byrgii: & singula tres, ad minimum, observationes solares præsupponunt.

EXEMPLUM PRIMUM. Ptolemæus invenit ab æquinoctio verno ad solstitium elapsos esse dies $94\frac{1}{2}$. à solstitio ad æquinoctium autumnale dies $92\frac{1}{2}$. per problema autem primū,

 diebus



diebus $94\frac{1}{2}$. competit æqualis motus Solis 93.gr.9.ferè. Diebus $92\frac{1}{2}$.--91.gr.11'.ferè. Sit ergo circulus Solis annuus ABCD & centrum ejus E, Æquinoctium vernum A, autumnale C, ſolſtitium B, bruma D. Per primum igitur interſtitium temporis, datus eſt motus Solis ab A, in B, ſive arcus AB, 93. gr. 9. ferè minutorum: per ſecundum interſtitium temporis datus eſt motus Solis à B in C, ſive arcus BC, 91 gr.11'. Connexis ergo punctis æquinoctialibus C & A, per rectam CFA, & ſolſtitialibus per rectam BFD, quæ rectę ſeſe rectè interſecent in puncto F, quia circumferentia ABC, eſt ſemicirculo major, quippe compoſita ex arcubus AB, 93.gr.9'.& BC, 91.gr.11'. qui duo arcus ſimul ſumti faciunt 184. gr. 20'. & quia etiam major eſt AB, quàm BC, ideo neceſſe eſt centrum circuli ABCD, inter BF, & FA, lineas, & apogeum inter æquinoctium vernum A & tropen æſtivam B, contineri. Nam centrum eccentrici & apogeum ſemper ſunt in eadem linea. Ducatur jam per centrum E, recta IEG, rectæ AFC, parallela. Quo facto, conſtituetur parallelogrammum rectangulum LEMF, cujus dimetiens

tiens

tiens FE producta in N, ostendet locum apogei Solis ad N, & eccentricitatem EF. Quæ duo hoc loco quæruntur. Quia igitur circumferentia ABC, nota est: quippe 184. gr. 20′. notum etiam est ejus dimidium AH, vel HC, 92. grad. 10′. & AG excessus arcus AH, supra quadrantem 2. grad. 10′. ejusque sinus rectus EM, 378064. respectu radii 10000000. (Copernicus sumit tantum 378. respectu radii 10000.) Item BH, excessus arcus AB, 93 gr. 9′. supra arcum AH, 92. 10. nempe 59′. ejusq; sinus rectus FM, 171616.

Quia verò in Triangulo plano FEM, nota sunt duo latera includentia rectum FM, & EM, facilè deinceps & latus reliquum & anguli reliqui innotescent.

Nam

I. Ut FM, 171616. ad EM, 378064 ita FM, 10000000.

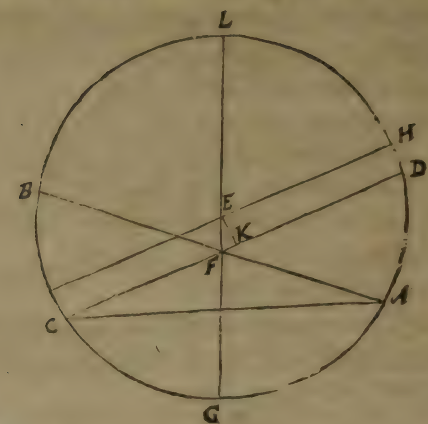
Ad 2202965 tangentem anguli EFM, 65. grad. 35′. 6″. cujus anguli complementum est angulus BFN, æqualis angulo HEN, 24. gr. 24′. 54″. per 2. axioma planorum: quo angulo tunc apogeum Solis N, apparuit ante Solstitium æstivum B.

II. Ut EM, sinus EFM, 65. gr. 35′. 6″. ad FE, radium: ita EM.

910754.	10000090.	378064.

Ad FE, 415192, quæ tunc fuit eccentricitas Solis per 1. ax. planorum.

EXEMPLUM SECUNDUM. Copernicus anno N. C. 1515. observavit hæc tria puncta. 1. Æquinoctium autumnale. 2. medium Scorpii. 3. æquinoctium vernum: & invenit ab æquinoctio autumnali usque ad medium scorpii dies 45. scr. 16. Item invenit ab æquinoctio autumnali usq; ad æquinoctium vernum dies 178. scr. 53½. Per problema autem primum diebus 45. scrupulis 16. competit æqualis motus 44. gr. 37′. ferè. Diebus 178. scrupulis 53½. competit æqualis motus 176. gr. 19′.



Quibus ita ſeſe habentibus repetatur circulus Solis annuus ABCD, & ſit rurſus æquinoctium vernum A, autumnale B, Medium autem Scorpii ſit C. Et conjungantur puncta A & B, item C & D, rectis A & B, ſecantibus ſeſe mutuo in centro mundi F, & circumferentiæ AGC ſubtendatur recta AC. Quoniam igitur data eſt circumferentia BC, 44. gr. 37′. Item BGA, 176 gr. 19′. Item per ſubtractionem arcus BC, 44. 37. ab arcu BGA, 176. 19. arcus CGA, 131 gr. 42′. Item angulus BAC, ad circumferentiam BC, ſubduplus 22. gr. 18½. per 53. p. 1. Trig. Item angulus apparentis motus BFC, 45. gr. (quippe tota libra 30. & dimidium ſcorpii 15.) & ejus complementum ad duos rectos CFA, 135. gr. Et duorũ CFA, & FAC, complementũ ad duos rectos FCA, 22. 41½. atq; illi ex oppoſito reſpõdens circũferentia dupla DA, 45 gr. 22′. quæ cõpoſita cum circumferentia AC, 131. 42. efficit DAC, 177. gr 5′. Et quoniam ex his datis liquet utrumq; ſegmentum circuli, ACB, & CAD, eſſe ſemicirculo minus, ideo manifeſtum eſt, centrum in reliquo BLD ſegmento contineri. Sit ergo centrum illud E, per quod agatur dimetiens LEFG, ut ſit apogeum L, perigeum G. Atque à cen-

centro E, in rectam CD, ducatur perpendicularis EK. Quibus ita præstructis hæc duo quæruntur.

1. Angulus apparentis distantiæ apogei Solis ab æquinoctio verno: nempe angulus AFL.

2. Eccentricitas Solis FE.

Iam datarum circumferentiarum etiam subtensæ datæ sunt: quippe dimidiarum circumferentiarum sinus dupli per 7. p. 2. Trig. Nempe AC, partium 18249550: CD, 19993522, quarum semidiameter ponitur 10000000. Primum igitur in Triangulo CKA, quia omnes anguli dati sunt, unà cum latere AC, inquiro inde latus CF, per 2. planorum hoc modo:

Ut CA, sinus anguli CFA, 45 gr. ad CF, sinū anguli CAF, 22 gr.

7071068 3795907. (18 $\frac{1}{2}$.

Ita CA, subtensa, ad CF, subtensam

18249550. 9796765.

Deinde CF, 9796765. subtraho a dimidia CD, nempe à recta CK, 9996761. & restat FK, 199996.

Postea circumferentiæ CAD, 177. 5. complementum ad semicirculum 2. gr. 55'. colloco ex parte dimidia ad D, ex parte altera ad C, ut sit DH, 1. 27 $\frac{1}{2}$. Quo facto EK, erit sinus arcus DH, 254500. Et sic in Triangulo EFK, nota erunt præter rectum ad K, latera duo includentia rectum FK & EK. Ex illis igitur porrò inquiro angulum EFK, sive LFD, per axioma primum planorum, hoc modo.

Ut FK, 199996. ad EK, 254500. ita radius FK, 10000000. ad EK, 12725254. tangentem anguli EFK, sive LFD, 51. gr. 50'. 18". quo addito ad angulum DFA, 45. gr. (nam angulus DFA, æquatur angulo BFC) efficitur angulus LFA, 96 grad. 50'. 18". quo angulo, tempore Copernici apogeum Solis, quoad apparentiam, distabat ab æquinoctio verno. Unde subtractus

quadrans 90. gr. relinquit distantiam apogei Solis à solstitio æstivo 6. gr. 50'. 18''. adeoque ostendit locum apogei Solis in 6. gr. 50'. 18''. Cancri. Copernicus suo calculo invenit tantum $6\frac{2}{3}$. gr. hoc est, 6. gr. 40. min.

Denique, quia in Triangulo EFK, præter duo latera FK & EK, jam etiam omnes anguli noti sunt, nempe EFK, 51. gr. 50'. 18''. & ejus complementum FEK, 38. gr. 9'. 42''. & rectus ad K, pro invenienda eccentricitate EF, dico per axioma 1. Triangulorum planorum.

Ut FK,	sinus FEK, 38. gr. 9'. 42''.	ad EF,	radium.
	6178825.		1000000.

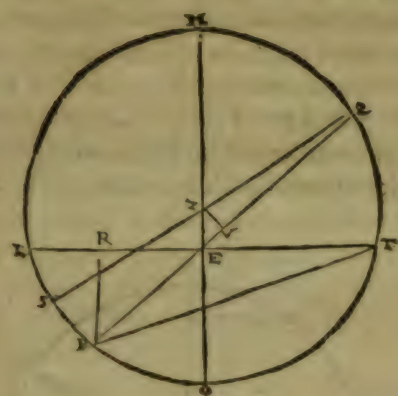
ita FK, 199996. ad EF, 323680.

Ergo eccentricitas Solis tempore Copernici fuit 323680. Copernicus rejectis ultimis tribus notis, retinet tantum 323.

EXEMPLUM TERTIUM. Tycho Brahe An. N. C. 1588. observavit hæc quatuor puncta. 1. Æquinoctium vernum. 2. medium tauri. 3. medium Leonis. 4. Æquinoctium autumnale. Et invenit ab æquinoctio verno, usq; ad autumnale, fluxisse dies 186. horas $18\frac{1}{2}$. A puncto autem vernali usque ad medium tauri, D. 46. H. 2. M. 55. Deniq; à medio Leonis usq; ad æquinoctium autumnale D. 46. H. 9. M. 40.

Per problema autem primum diebus 46. H. 2. M. 55. secundum calculum Tychonis, competit æqualis motus Solis 45. gr. 27'. 34''. Diebus 186. H. $18\frac{1}{2}$. competit æqualis motus 184. gr. 5'. 24''.

Quibus ita se habentibus, describatur circulus Solis eccentricus THLO. Et sit æquinoctium vernum T, autumnale L, Medium tauri Q. Erit ergo æqualis motus ab æquinoctio verno in æquinoctium autumnale arcus THL, ejusque complementum ad integrum circulum arcus LOT. Æqualis motus ab



tus ab æquinoctio verno uſque ad medium tauri TQ. Conjungantur deinde puncta T & L, per rectam TL. Et à Q, per E, centrum univerſi, ducatur recta QEP. Item à Q, ducatur per centrum eccentrici Z, recta QZS. Et à Z, in EQ, perpendicularis ZV. Item à P, in LE, perpendicularis PR. Erit ergo angulus HEQ, diſtantia ap. gei H, à medio tauri Q: recta vero ZE, erit eccentricitas. Quæ duo hîc quæruntur.

Quia igitur notus eſt æqualis motus ab æquinoctio verno ad autumnale: ideò notus eſt arcus THL, 184. gr. 5'. 24". ejuſq; complementum ad integrum circulum LOT, 175. gr. 54'. 36".

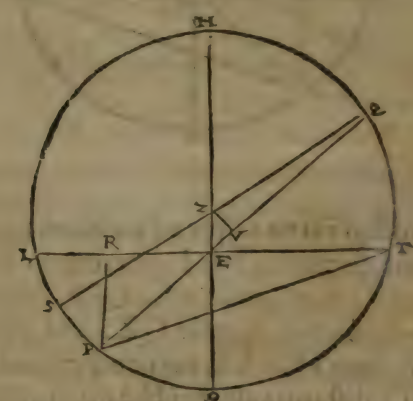
Quia item notus eſt motus æqualis ab ęquinoctio verno in medium Tauri: ideo notus eſt arcus QT, motum illum repræſentans 45. gr. 27'. 34".

Quia deniq; notus eſt motus apparens ab æquinoctio verno in medium Tauri: ideò notus eſt angulus QET, motum illum repræſentans 45. gr.

Porrò,

Porrò, quia notus est angulus QET, 45. gr. notum etjam est ejus complementum ad duos rectos PET, 135. gr.

Item, quia notus est arcus QT, 45. gr. 27′. 34″ notus est etjam angulus illi oppositus QPT, ad arcum QT, subduplus, 22. gr. 43′. 47″. per 53. p. 1. Trigonometriæ nostræ. Qui angulus QET, additus ad angulum PET, efficit 157. grad. 43′. 47″. Cujus complementum ad duos rectos est PTE, 22. gr. 16′. 13″.



Cujus duplum, 44. gr. 32′. 26″. est arcus illi oppositus LP, rursus per 53. p. 1. Trigonometriæ nostræ. Qui arcus LP, 44 grad. 32′. 26″. subtractus ab arcu LOT, 175. gr. 54′. 36″. relinquit arcum POT, 131. grad. 22′. 10″. Cujus arcus subtensa est 18225868. duplus nempe sinus 9112934. arcus POT, dimidii. 65. gr. 41′. 5″.

Quod si ad arcum POT, 131. gr. 22′. 10″. addas arcũ TQ, 45. gr. 27′. 34″, etiam innotescit arcus POQ, 176. gr. 49′. 44″. Cujus dimidium est arcus 88. grad. 24′. 52″, cujus arcus sinus est 9996171. Cujus duplum 19992342. est subtensa arcus POQ, nempe recta PQ.

Iam

Iam, in Triangulo PRT, rectangulo ad R, quia notus est acutus ad T, 22. gr. 16'. 13". ideo data est ratio laterum tripliciter. Et quia præterea notum est latus TP, 19992342. dabitur etiam latus PR, triplici; facilimè autem, hac proportione:

Ut PT, radius	—	10000000.
Ad PR, sinum anguli PTR		3789761.
Ita PT, subtensa	—	18225868.
Ad PR, in iisdem partibus		6907168.

Per primum axioma planorũ.

Porrò in Triangulo PER, quia notus est angulus PER, æqualis angulo QET, 45 gr. Et latus PR, 6907168. facilimè etjam dabitur latus PE, hac proportione:

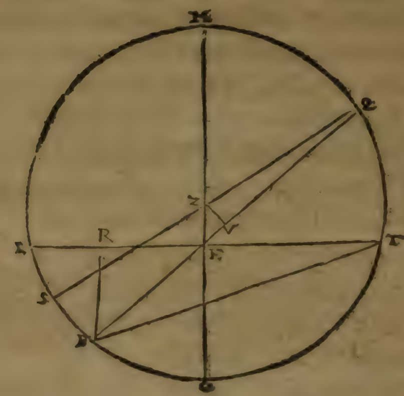
Ut PR, radius	—	—	10000000.
Ad PE, secantem anguli RPE			14142136.
Ita PR,	—	—	6907168.
Ad PE, in iisdem partibus		—	9768210.

Rursus per primum axioma planorum.

Hoc verò segmentum PE, 9768210. si auferatur ab integra subtensa PQ. 19992342. relinquitur segmentum EQ, 10224131. A quo si rursus auferatur dimidia subtensa PQ, nempe VQ, 9996170. relinquitur EV, 227961.

Sed & angulus SQP, notus est: dimidium nempe arcus SP, qui arcus est arcus QOP, complementum ad semicirculum. Quia igitur arcus QOP, est 176. gr. 49'. 44". ideo arcus SP, est 3. gr. 10'. 16". Angulus vero SQP, 1. gr. 35'. 8". Cujus anguli sinus sine controversia est recta ZV. Ergo recta ZV, est 276696. (Pro quo numero Tycho perperam habet 276591: quia non arcum SP: ut debebat: sed sinum illius arcus dimidiavit.)

Quia igitur in Triangulo ZVE, jam nota sunt duo latera circa rectum, ZV, 276696. & EV, 227961. facile etiam innotescet angulus ZEV, & latus ZE. Nam:



I. Ut EV, 227961. ad VZ, 276696. ita EV, radius 10000000, ad VZ, tangentem anguli VEZ, 12137866. Cui tangenti respondet angulus VEZ, vel HEQ, 50. grad. 30′. 57″. Cui si addas angulum QET, 45. gr. efficitur angulus HET, 95. grad. 30′. 57″. Cecidit igitur tunc apogeum Solis in 5. grad. 30′. 57″. Cancri. Non in 5. grad. 30′. ut habet Tycho, ex causa nuper indicata.

II. Ut EV, radius 10000000. ad EZ, secantem anguli ZEV 15726609. ita EV, 227961. ad EZ, 358505. Quæ fuit eccentricitas illius temporis. Pro qua Tycho perperam habet 358416. ex causa jam bis tacta.

EXEMPLUM QUARTUM. Justus Byrgius, Mechanicus Cassellanus, & Mathematicus ingeniosissimus, observavit an. 1591. Solem his tribus diebus: nempe 13. Ianuar. 22. April. & 7. Augusti. Et in prima quidem observatione invenit locum Solis 3. grad. 7′. aquarij. In secunda: 11. grad. 26′. Tauri. In tertia:

tertia: 23. grad. 42. Leonis. Tempus inter primam & secundam observationem fuit dierum 99. Tempus inter secundam & tertiam observationem fuit dierum 107. Medius motus diebus 99. cōveniens est 97. gr. 34'. 44". Medius motus 107. dieb' conveniens est 105. grad. 27'. 51'. Verus motus diebus 99. peractus fuit 98. grad. 19'. Verus motus diebus 107. peractus fuit 101. grad. 16'.

Descripto itaq; circulo Solis eccentrico FGIK. Sit prima observatio ad F, secunda ad G, tertia ad H.

Per æqualem motum à prima observatione ad secundam, notus est arcus FG, 97. gr. 34'. 44". ejusq; de Canone subtensa, partium 15045870. qualium radius EI, sit 10000000.

Per æqualem motum inter secundam & tertiam observationem notus est arcus GH, 105. grad. 27'. 51". ejusq; de Canone subtensa 15850698.

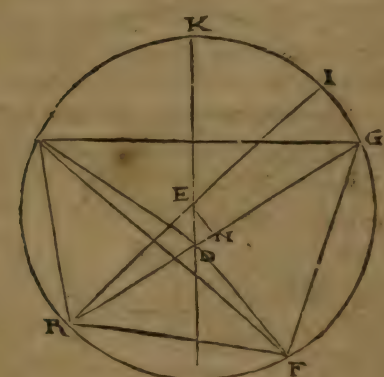
Per apparentem motum à prima observatione ad secundam, notus est angulus GDF, 98. gr. 19'.

Per apparentem motum inter ſecundam & tertiam obſervationem notus eſt angulus GDH, 102. gr. 16′.

Per aggregationem verò arcuum FG & GH, manifeſtus fit arcus FGH, 203. gr. 2′. 35″, ejuſque complementum HRF, 156. gr. 57′. 25″.

Per arcum FG notum notus eſt angulus GRF, ad arcum FG, ſubduplus 48. gr. 47′. 22″. in Triangulo GRF.

Item, per angulum FDG, notum 98. gr. 19′. notus eſt etiam angulus complementi RDF, 81. gr. 41′. Et per aggregatum horum duorum angulorum RDF, & DRF, quod aggregatum eſt 130. gr. 28′. 22″. notus eſt etiam angulus tertius in Triangulo RDF, nempe RFD, 49. gr. 31′. 38″.



Sic in triangulo HDR, notus eſt angulus HRD, ſubduplus ad arcum oppoſitum HG, 52. grad. 43′. 55″½. Item angulus HDR, reſiduum anguli FDH, ſi inde auferatur angulus FDR, qui erat 8. gr. 41′, Angulus autem FDH, erat 159. gr. 25. comple-

complementum ſcilicet angulorum FDG, & GDH, per apparentes motus datorum. Ergo angulus HDR, eſt 77. gr. 44′. Qui junctus angulo HRD, 52. gr. 43′. 55″½. efficit 130. grad. 27′. 55″½. cujus complementum ad duos rectos eſt angulus RHD, 49. gr. 32′. 4″½.

Quia igitur in triangulo HRD, noti ſunt omnes anguli, nota ſunt etiam latera in partibus, quarum dimetiens circuli triangulo HRD, circumſcripti ſit 10000000, nempe ſic.

Anguli HRD, 52. gr. 43′. 55″½. Sinus 7929849. HD.
Anguli HDR, 77. gr. 44′. 0″. Sinus 9771693. HR.
Anguli RHD, 49. gr. 32′. 4″½. Sinus 7607978. RD.

Item, quia in triangulo RDF, noti ſunt omnes anguli, nota ſunt etiam latera in partibus, quarum dimetiens circuli triangulo RDF, circumſcripti ſit 10000000. nempe ſic.

Anguli RDF, 81. gr. 41′. 0″. Sinus 9894837. RF.
Anguli DRF, 48. gr. 47′. 22″. Sinus 7522935. DF.
Anguli DFR, 49. gr. 31′. 38″. Sinus 7607144. DR.

Porrò, in triangulo RHD, cupio latus HR, habere in partibus, quarum RD, eſt 7607144. & RF, 9894837. Dico igitur per ſecundum axioma planorum:

Ut RD, 7607978. ad RH, 9771693.
Ita RD, 7607144. ad RH, 9770622.

Iam igitur in triangulo FRH habeo duo latera FR, & RH, in iiſdem partibus, nempe FR, 9894837. & RH, 9770622.

In eodem triangulo FRH, habeo angulum FRH, ſubduplum ad circumferentiam oppoſitam FGH, quæ circumferentia ſupra inventa eſt, 203. gr. 2′. 35″. Ergo angulus FRH, eſt 101. gr. 31′. 17″½.

Inquiro igitur reliquos duos angulos per tertium axioma planorum, hoc modo:

Latus FR,	9894837.	
Latus RH,	9770622.	
Summa.	19665459.	
Differentia,	124215.	
Angulus FRH,		101. grad. 31'. 17''½.
Summa reliquorum duorum		78. grad 28'. 42½.
Dimidium.	39. gr. 14. 21¼. Tang. 8167209.	

Dico igitur:

Ut 19665459. ad 124215. ita 8167209. ad 51587. tangentem anguli 0. gr. 17'. 44''. Qui additus ad dimidium angulorum quęsitorum 39. gr. 14. 21. efficit angulum FHR, ex duobus quæsitis maximũ 39. gr. 32'. 5''. Demtus verò idem angulus 0. gr. 17'. 44''. ab eodem angulo 39 gr. 14'. 21''. relinquit angulum è quæsitis minimum HFR, 38. gr. 56'. 37''.

Noto autem angulo HFR, notus est etiam arcus HR, duplum nempe anguli HFR, 77. gr. 53'. 14''. Quo arcu HR, 77. gr. 53'. 14''. demto de arcu HRF, 156. gr. 57'. 25''. relinquitur arcus RF, 79. gr. 4'. 11''. Qui additus ad arcum FG, 97. gr. 34'. 44''. efficit arcum RFG, 176. gr. 38'. 55''. Cujus complementum ad semicirculum est arcus GI, 3. gr. 21'. 5''. cujus dimidium est angulus oppositus GRI, 1. grad. 40'. 32''½. Cujus sinus est recta EN, 292421. Quâ notâ, recta DN, porrò inquiritur hoc modo.

In Triangulo FRD, nota est ratio laterum: è superioribus. Atqui jam etiam latus RF, notum est, in partibus quarum semidiameter circuli eccentrici sit 10000000: atq; adeo in partibus quarum EN, sit 292421. Nam arcus FR, notus est, 79. gr. 4'. 11'. Nota igitur est etiam subtensa illius arcus, nempe duplus sinus arcus dimidii, 39. gr. 32'. 5''½. Qui sinus est 6365475. Ergo subtensa FR, est 12730950. Itaque per secundum planorum, dico:

Ut

Ut RF, sinus anguli RDF.	9894837.
Ad RD, sinum anguli RFD.	7607144.
Ita RF, subtensa	12730950.
Ad RD, in iisdem partibus.	9787544.

Cæterùm, antea datus est arcus RFG, 176. gr. 38'. 55''. Cujus dimidiũ est 88. gr. 19'. 27''$\frac{1}{2}$. Cujus sinus est RN, vel NG, 9995818. Unde si subtrahas rectam RD, 9787544. relinquitur recta DN 208274. Quâ notâ porrò dico:

Ut DN, 208274. ad EN, 292421. ita DN, radius. 10000000. ad EN, tangentem anguli EDN, 14040206. cui tangenti competunt 54. grad. 32'. 28''. Ergo angulus KDG, est 54. grad. 32'. 28''. Punctum autem G, erat 11. gr. 26', tauri, hoc est, 41. grad. 26'. ab ariete. Adde ergo:

41. gr. 26'.
54. gr. 32'. 28''. Et invenies.
95. gr. 58'. 28''.

Ergo apogeum illo tempore fuit in 5. gr. 58'. 28''. Cancri.

Denique, notis in triangulo plano rectangulo DEN, duobus lateribus & omnibus angulis, ad inveniendam eccentricitatem DE, porrò dico:

Ut DN, radius, 10000000. ad DE, secantem anguli EDN, 17237852. ita DN, in partibus quarũ EI, sit 10000000, — 208274, ad DE, in iisdem partibus 359019.

Ergo eccentricitas Solis illo tempore fuit 359019. partium, qualium radius eccentrici sit 10000000.

PROBLEMA NONUM.

Dierum civilium inæqualitatem corrigere. Cop. lib. 3. cap. 26.

Dies

Dies civiles (quos Copernicus vocat dies naturales.) inæquales esse, ad primum problema libri secundi diximus. Corrigitur autem ista inæqualitas hoc modo.

Primum, sint in promptu medius motus Solis compositus, hoc est, medius motus ☉, ab æquinoctio verno medio: & ascẽsio recta veri loci Solis ab æquinoctio verno apparẽte: tùm ad tempus datum, tùm ad radicem temporis dati.

Deinde, medium motum minorem subduc à majore: similiterque ascensionem rectam minorem ab ascensione recta majore.

Quo facto, si differentiæ mediorum motuum & ascensionum rectarum fuerint æquales, tempus quoq; est æquale.

Sin autem: excessus quidem differentiæ ascensionum rectarum est ad tempus datum addendus: excessus verò mediorum motuum est ab eodem tempore dato auferendus.

Causa est in promtu. Quia differentiæ illæ mediorum motuum & ascensionum rectarum nihil aliud sunt, quàm ostensio, utrum medius, an verus motus Solis terminum dati temporis (si motus uterq; in æquatore, ab ♈, versus ♋, censeatur.) prætercurrerit. Quod si ergò verus motus, sive ascensio ejus recta prætercurrerit: tempori dato excessus necessariò est addendus: & contra.

Exemplum.

Tempore N. C. medius motus ☉, ab æq. m. fuit *278. 2'.*

Verus locus ☉, ab æq. vero *279. 17.*

ejusque ascensio R, *280. 6.*

Tempore supra dato medius motus ☉, ab æq. m. erit *107. 59.*

Verus locus ☉, ab æq. vero *107. 55.*

Ejusq; ascensio recta. — *109. 25.*

Calcu-

Calculus talis erit.

Medius motus N. C.	278. gr.	2'.	AR, veri motus.	280. gr.	6.
Medius motus noster	107.	59.	AR, veri motus.	109.	25.
Differentia	170.	3.	Differentia	170.	41.
	—	—		170.	3.
Excessus differentiæ ascensionum R.				0.	38.

Hic excessus est addendus ad horas duas supra datas.

Conveniunt autem singulis gradibus Æquatoris 4. scrupula prima unius horæ. Nam

Ut 15. gr. ad 60. scr. hor. ita 1. gr.
Ad 4. scr. hor.

Ergo 38. primis conveniunt 2'. 32''. scrupula horaria.
Nam
Ut 1. grad. ad 4. ita 0. gr. 38.

	2'. 24''.	30'''.
	8.	6.
ad	2'. 32''.	2.

Ergo tempus supra datum, & per hoc problema correctum, sive æquatum, est

Annuus 1600. dies 30. Iunii. hora P.M. 2'. 32''.

Quantum igitur Sol proprio motu interim emensus est, dum 2'. 32''. unius horæ ascenderunt, tantum ipsius motui, per problema sextum reperto, est addendum. Conficit autem Sol singulis horis duo scrupula prima, & 28. ferè tertia. Nam

Ut 24. horæ ad motum diurnum. 59'. 8''. 11'''. 22''''. ita 1.

6.		14. 47. 2. 50.
3.		7. 23. 31. 25.
1.	Ad —	2''. 27. 50. 28.

Ergo hora nulla, scrupulis 2'. 32''. conficit 6''. 14''''.

Nam

Ut 1. hor. ad 2″. 28‴. 0⁗. ita 0. hor. 2′. 32″.

4. 56. 30.
1. 14. 2.
4.
ad 6‴. 14⁗.

Nihil autem in motu Solis habent momenti 6‴. 14⁗.

Ergo ista additio hic tutò negligi poteſt.

PROBLEMA DECIMUM.

Data differentia meridianorum, differentiam horarum intelligere, & contra.

REGULA. Si locus ſit orientalior, adde differentiam longitudinis, in tempus converſam, ad horas datas: ſi ſit occidentalior, ſubtrahe.

Orientalior autem eſt locus, cujus longitudo eſt major: & contra.

EXEMPLUM Longitudo meridiani Cracovienſis, ad quē noſtrum quoq; exemplum ex ſententia Copernici hactenus ſupputavimus, eſt 45. gr. 30. minutorum.

At longitudo meridiani Heidelbergenſis eſt tantum 30. grad. 45′.

Ergo Heidelberga eſt occidentalior.

45. gr. 30′.
Differentia autem 30. 45.
Longitudinis eſt 14. gr. 45′.

Quibus gradibus & ſcrupulis reſpondent H. 0. ſcr. 59′.

Nam

Nam.

Ut 1. gr. ad 4'. ita 14. gr. 45'.

56.

3.

ad 59.

Ergo quæ Cracoviæ est hora usualis 2. P. M. ea Heidelbergæ est hora 1. gr. 1'. P. M.

Nam si de 2. h. 0'.
Subtrahas 0. h. 59'.
Relinquuntur 1. h. 1'.

Sic ex diversis meridianis, diversas apparentiarum cœlestium horas: & contra, ex diversis apparentiarum cœlestium horis diversos diversorum locorum meridianos indagare poteris. Atq; hoc fundamentum est observandarum longitudinum, præcipuorum in terra locorum. Si nempe observetur, quota hora eadem Eclipsis Lunaris, aut alius quispiam insignis motus apparuerit in hoc, vel illo loco.

PROBLEMA UNDECIMUM.

Distantiam Solis à centro terræ supputare.

Distantia Solis à centro terræ maxima EN, per Eclipses reperta est semidiametrorum terræ 1179.

Hinc reliquæ distantiæ Solis à centro terræ ita supputantur.

Si Sol sit in perigeo, adeoque distantia ejus à centro terræ minima ER. Quia ER, est talium partium 9676750. qualium EN, est 10323250. per problema sextum. Ideo dico:

Ut EN, 10323250. ad ſemidi. 1179, ita ER, 9676750. ad ſemid. 1105. 9'. 51".

Si Sol neque in apogeo, neque in perigeo ſit: Verbi gratia, ſi ad O, conſiſtat:

Primum colligo, ut ſemper in promtu habeam ſemidiametros radii eccentrici LO, hoc modo:

Ut EN, 10323250. ad ſemid. 1179. ita LN, vel LO, 10000000. ad ſemid. 1142. 4'. 56".

Deinde, pro invenienda diſtantia Solis à centro terræ EO, dico per axioma ſecundum.

Ut

Ut LEO, 8. $31\frac{1}{2}$. ad LO, semid ita ELO, 8. gr. 48'.

Sinus 1482409. 1142. Sin. 1529858.

ad $1178\frac{1}{2}$. semid. terræ.

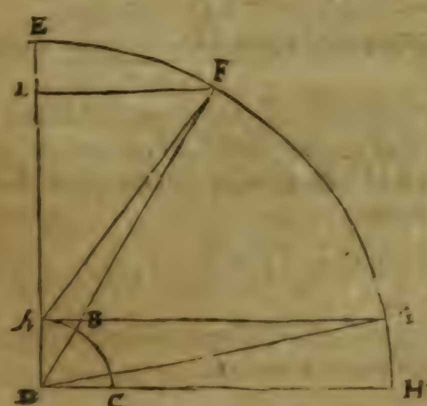
PROBLEMA DUODECIMUM.

Parallaxes Solis supputare.

Hîc duo requiruntur. 1. distantia Solis à vertice, in circulo, qui per polos horizontis. 2. distantia Solis à centro terræ, in linea recta à centro terræ ad Solem ducta. Distantia Solis à vertice, si non sit in ipso horizonte, reperitur per problema octavum libri primi. Et erit ad tempus supra datum 29. gr. 51'.

Distantia Solis à centro terræ reperitur per problema proximè præcedens. Et erit ad tempus modo dictum $1178\frac{1}{2}$. semidiametrorum terræ.

His duobus datis, parallaxis Solis facilè supputatur maxima quidem, quæ circa horizontem contingit, per axioma 1. planorum, hoc modo:



Ut GD, $1178\frac{1}{2}$. ſemid. terræ ad DA, 1. ſemid. terræ. ita GD. radius 10000000.

Ad DA, 8485. ſinum anguli DGA, 2'. $55\frac{1}{2}$''.

Cæteræ verò, vel per axioma 3. hoc modo.

Latus DF, $1178\frac{1}{2}$. ſemidiametri terræ.
Latus AD. — 1. ſemidiameter terræ.

Summa $1179\frac{1}{2}$.
Differentia $1177\frac{1}{2}$.
Angulus ADF, 29. gr. 51'.
Compl. ad 2. rectos 150. 9.
Dimidium — 75. gr. 4'. 30''. Tangens 37516877.

Ergo:

Ut $1179\frac{1}{2}$. ad $1177\frac{1}{2}$. ita 37516877.

Ad 37453262. tangentem anguli 75. grad. 3'. 2''. qui ſublatus de angulo 75. grad. 4'. 30''. relinquit parallaxin Solis AFD, o. grad. 1'. 28''.

Vel per axioma primum, hoc modo.

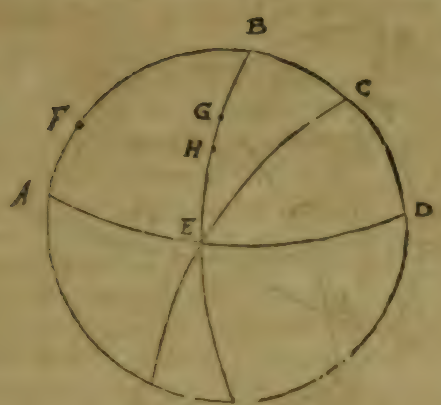
ADF, 29. gr. 51'. Sinus LF, 4977310.
Sinus complementi LD, 8673314.
Sinus maximæ parallaxeos AD, 8485. Subtr.
AL, 8664829.

Ut AL, 8664829, ad LF, 4977310. ita AL, 10000000. ad LF, 5744268. tangentem anguli LAF, 29. gr. 52'. 28''. A quo demtus angulus LDF, 29. grad. 51'. relinquit angulum AFD, o. gr. 1'. 28''. ut ante.

PROBLEMA DECIMUM TERTIUM.

Quomodo parallaxis Solis, longitudinem, vel latitudinem eius mutet, oſtendere. Cop. lib. 4. cap. 26.

Si ver-



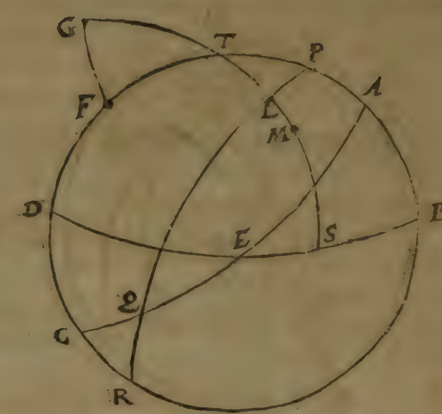
Si verticalis per Solem transiens sit ipse Signifer, tota parallaxis in longitudinem transit: eamq; minuit in quadrante Signiferi occidentali, auget in quadrante orientali. Sit enim Meridianus, idemq; colurus solstitiorum ABCD. Horizontis semicirculus occidentalis AED. Æquator CE. Signifer, idemq; circulus verticalis BE, polus Æquatoris F, polus Signiferi A, Locus Solis ad G, parallaxis GH, longitudo Solis EG.

Manifestum est longitudinem Solis EG, per parallaxin GH, quoad visum minui arcu GH. Nunquam autem hoc cõtingere potest, nisi elevatio poli par sit maximæ declinationi Solis, & solstitium polo proximum in medio cœli existat.

¶ Si verticalis per Solem transiens sit Signifero rectus, tota parallaxis in latitudinem transit: atque adeò latitudinem aliquam austrinam Soli conciliat.

Sit enim Meridianus ABCD, Horizontis semicirculus occidentalis BED. Æquator AEC, Signifer PQR, polus Æquatoris F, polus Signiferi G: polus Horizontis T, Sol ad L

parallaxis



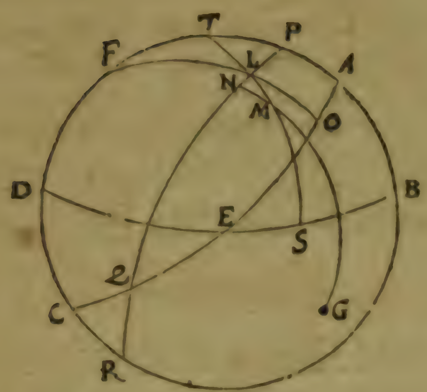
parallaxis Solis LM, verticalis per Solem transiens TLS. Signifero rectus ad L. Quia igitur verticalis TLS, est Signifero rectus, ideo per polos ejus transit: per 57. p. 1. Trig. Quia autem verticalis TLS, per polos Signiferi transit, ideò est unus è circulis latitudinum: per principia sphærica: ac proinde tota parallaxis LM, est quasi latitudo Solis austrina.

¶ Si verticalis per Solem transiens sit Signifero obliquus, parallaxis Solis partim longitudinem ejus mutat, partim latitudinem aliquam austrinam ipsi conciliat.

Sint enim cætera, ut ante, sed verticalis TLS, per Solem transiens jam sit Signifero obliquus. Et sit parallaxis LM, ac per locum Solis visum M, transeat circulus latitudinis GMN, angulis ad N rectis, per principia sphærica. Manifestum est, longitudinem Solis QL, hoc modo diminui arcu NL, & Solem videri in latitudine austrina NM.

¶ An autem angulus sectionis verticalis & signiferi, nempe angulus TLP, sit rectus an obliquus, id ita cognosces.

NOTA



NOTA est aut esse potest per antecedentia problemata ascensio recta Solis QO, quæ composita cum arcu horario dato OA, constituit arcum QA, cujus complementum ad semicirculum est arcus QC. Quo noto, quia in Triangulo QCR, præterea etiam angulus maximæ declinationis ℭQR notus est, & angulus ad C. rectus: ideo dico:

I. Ut radius ad tangentem CQR, ita sinus QC, ad tangentem arcus CR, cui ex opposito æquatur arcus PA, quo demto de arcu AT, (qui arcus par est elevationi poli DF.) relinquitur arcus TP, per ax. 2. sphær.

II. Notis in Triangulo QCR, lateribus QC, & CR, includentibus rectum QCR, inquiro latus tertium QR, per axioma quartum. Idq; compono cum longitudine Solis data QL. Unde innotescit complementum ad semicirculum LP.

III. In eodem Triangulo QCR, dico:

Ut QR, sinus ad QCR, radium, ita QC, sinus ad QRC, sinum per ax. 3. cui angulo QRC, ex opposito æquatur angulus LPT, per 59. p. 1.

IV. Ut LT, ad LPT, ita TP, ad TLP, per ax. 3. sphær.

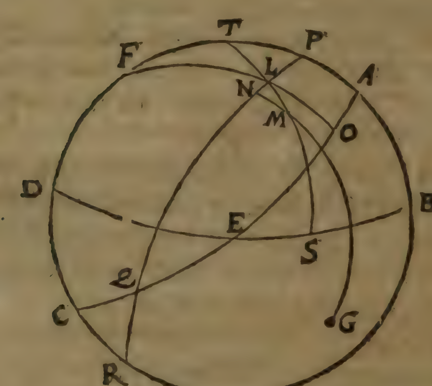
EXEMPLUM. Ad tempus supra datum longitudo Solis QL, erit 107.56'.37''½. declinatio LO, 22. gr. 15'. 44''. ascensio recta QO, 109. gr. 26'. 40'', angulus horarius LFT, sive arcus OA, respectu Meridiani Heidelbergensis 15. gr. 15'. Quæ duo simul sumta efficiunt arcum QA, 124. gr. 41'. 40''. cujus complementum ad semicirculum QC, est 55. gr. 18'. 20''. Angulus autem maximæ declinationis CQR, est 23. gr. 28'.

Dico igitur:

I. Ut radius ad tãg. CQR, 23. gr. 28' ita sinus CQ, 55. gr. 18'. 20''.

10000000. 4341208. 8221992.

Ad 3569337. tangentem arcus CR, 19. gr. 38'. 35''. per ax. 2. subtracto autem CR, hoc est, AP, de elevatione poli AT, 49. gr. 35'. relinquitur arcus TP, 29. gr. 56'. 25''.



II. CR.

II.	CR, 19. gr. 38′ 35″.	—	19. gr. 38′ 35″.			
	QC, 55. 18. 20.	—	34. 41. 40.			
	74. 56. 55.		54. 20. 15.	8124653.		
	15. 3. 5.	—	—	2596853.		
				10721506.		
				5360753.		

Sinus arcus 32. gr. 25′. cujus complementum 57. gr. 35′. est arcus QR. Qui arcus compositus cum longitudine Solis QL, efficit arcum RL, 165. gr. 31′. 37″ ½. cujus complem. ad semicirculum est arcus LP, 14. grad. 28′. 22″ ½. per axiom. 4. sphæric.

III. Ut QR, 57. gr. 35′. ad CQR, rad. ita QC, 55. gr 18′. 20″.

8441720.	10000000.	8221992.

Ad QRC, sive LPT, 97402. sinum anguli 76. gr. 53′. 55″. per axiom. 3.

IV. Ut LT, 29. gr. 51′. ad LPT 76. gr. 54′. 40″. ita PT, 20. gr. 50′ 22″.

4977310.	9740199.	4990844.

Ad 9766684. sinum anguli TLP, 77. grad. 35′. 55″. per axiom. 3.

Ergo angulus TLP, sectionis verticalis cum Signifero in hoc exemplo non est rectus: ac proinde parallaxis LM, partim longitudinem, partim latitudinem Solis mutat. Longitudinem minuit arcu NL, latitudinem austrinam Soli conciliat, arcum NM, qui duo arcus porrò facilè reperiuntur, hoc modo.

In Triangulo NLM.

I. Ut LNM, rect° ad LM, parallaxin 1′. 28″. ita NLM, 77. gr. 35′. 55″.

10000000.	Sin. 4264.	9766684.

Ad 4164, sinum arcus NM, 1′. 26″. quæ erit visa latitudo Solis austrina ad tempus supra datum.

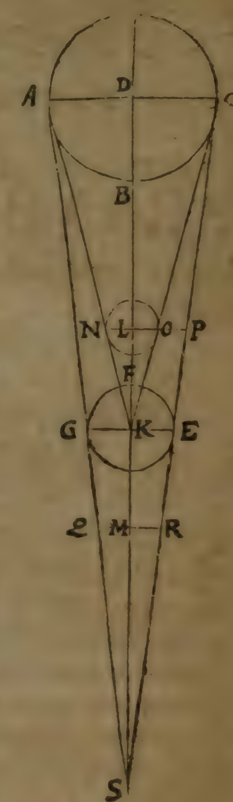
II. Ut Tãg. NLM, 77. gr. 35'. 55''. ad rad.

454826.	10000000.

Ita tangens MN, 1'. 26''.

4164.

Ad 916. ſinum arcus NL 18'. qui arcus ſubtractus à vera longitudine Solis 107. gr. 56'. 37½. relinquit viſam longitudinẽ Solis 107. gr. 56'. 19''½. per ax. 2.



PROBLEMA XIV.

Data vera diametro Solis, unà cum diſtãtia Solis à centro terræ, apparentem diametrũ Solis per numeros invenire.

Vera ſemidiameter Solis ſecundum Copernicum eſt ſemidiametrorum terræ 5. gr. 27'. ferè.

Diſtantia autem Solis à centro terræ ad tempus nuper conſtitutum erit 1178½. ſemidiametrorum terrę per problem. 12. Dico igitur:

Ut KD, 1178½. ad DC, 5. gr. 27'.

70710. ſcr.	327. ſcr.

Ita KD, radius 10000000.

Ad DC, 46245. tangentem anguli DKC, 15'. 54''. Ergo apparens diameter Solis tum erit 31'. 48''.

FINIS.

BAR-

BARTHOLOMÆI PITISCI
Grunbergensis

PROBLEMATUM ASTRONOMICORVM

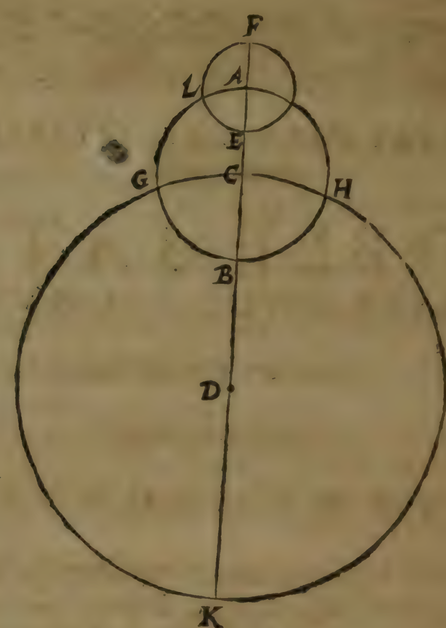
LIBER QUINTUS.

De motu Lunæ proprio.

PROTHEORIA.

SOL unicum habet motum, nempe longitudinis. Semper enim versatur sub Ecliptica. Reliqui planetæ duplicem habent motum, unum longitudinis, alterum latitudinis. Nā ut via Solis ad Æquatorem est obliqua: ita viæ reliquorum planetarum ad viam Solis sunt obliquæ. Igitur Lunæ & longitudinis & latitudinis motus seorsim est explicandus. Motus longitudinis Lunæ est ab occasu in ortum, ut omnis omnium stellarum motus proprius. Etsi autem per se proculdubio est æqualis: nobis tamen apparet inæqualis. Causam inæqualitatis alii aliam excogitarunt. Copernicus affingit motui longitudinis Lunæ duos epicyclos. Iuxta cujus sententiam, sit circulus mundo concentricus, at Eclipticæ pro latitudine Lunæ obliquus GCHK, centrum ejus & simul centrum terræ D. Dimetiens FEDK, epicyclus primus AB, secundus EF. Et centrum quidem epicycli primi C, moveatur secundum or-

 dinem



dinem signorum à C, in H, sic ut tempore menstruo totum circulum CHKG, obeat. Centrum verò epicycli secundi A, in circumferentia epicycli primi moveatur motu contrario ab A, in G, paulò celerius, quam centrum epicycli primi. Luna denique ipsa, moveatur in circumferentia epicycli secundi ab E, in L, motu ad motum circuli CH, duplo: sic, ut quando linea FED, est cum loco Solis medio (hoc est, in conjunctionibus & oppositionibus Solis & Lunæ.) Luna sit centro C proxima, hoc est, in E, constituta: in quadraturis autem remotissima, hoc est, in F, constituta. His ita positis,

poſitis, motus longitudinis Lunæ declarari,& ratio apparentis circa motum illum inæqualitatis reddi poterit. Motus latitudinis Lunæ nihil aliud eſt, quàm motus nodorum Eclipticæ & circuli obliqui Lunæ: quos nodes vulgò vocant caput & caudam Draconis. Moventur autem illi nodi contra ſignorum ordinem, prorſus, ut nodi Eclipticæ & Æquatoris. Itaq; hic nulla nova theoria eſt opus.

PROBLEMA PRIMUM.

Medium ſive æqualem motum longitudinis Lunæ à Sole (hoc eſt, motum puncti C in H, &c.) ad quodvis datum tempus colligere. Cop. lib. 4. cap. 41.

Motus longitudinis Lunæ,ut & reliquorum 5. planetarum, primum deducitur à Sole. Deinde collatione facta cum motu Solis, facilè ejus locus, vel à prima ſtella Arietis, vel ab æquinoctio verno reperitur.

Eſt autem periodus curſus Lunæ à Sole dierum 29. ſcrupulorum 31'. 50''. 7'''. 52''''. 57'''''.

Unde conficitur

Motus ejus annuus		1''. 14'. 9. gr. 37'. 22''. 30'''. 25''''.
Motus diurnus	—	12. 11. 26. 41. 31.
Motus horarius	—	30. 28. 36. 44.

Et fuit tempore N. C. motus Lunæ à Sole 3'. 29. gr. 58'.

Ex quibus ita ſumtis, æqualem motum Lunæ ad tempus ſupra datum colligo hoc modo.

II. Sex. an.		Sex. anni.
1. — 1''. 14'. 9'. 37. gr. 22'. 30''. 25'''.	—	26. 40.
24. 43. 12. 27. 32. 8. 20.		20. 20.
6. 10. 48. 6. 53. 2. 5.		5. 20.
49. 26. 24. 55. 4. 16.		1.
30. 42. 51. 6.		

II. Sex. d. — Sex. d. ſcr.

1. — 12ˢ. 11. gr. 26′. 41″. 31‴. — *3. 35. 35′. 6″. 26‴.*

36. 34. 20. 4. 33. — *30. 30.*
6. 5. 43. 20. 45. 30. — *5. 5.*
1. 0. 57. 13. 27. 35. Nota 6″. 20‴. ſcrupula die-
6. 5. 43. 20. 45. erum ſunt 2′. 32″. ſcrupula
1. 0. 57. 13. 27. horaria per correctionẽ
1. 13. 8. 40. inæqualitatis dierum civi-
4. 3. 48. lium li. 4. probl. 9. reperta.

1. 48. 8. 36. 32. 45. Motus dierum.
0. 36. 42. 51. 6. 0. Motus annorum.
3. 29. 58. Radix.
5ˢ. 54. gr. 49′. 27″. 38‴. 45⁗. Summa. Motus æqualis Lunæ à Sole, ad tempus ſupra datum.

PROBLEMA SECUNDUM.

Æqualem motum anomaliæ lunaris, ſive æqualem motum epicycli primi, nempe puncti A, in G, &c. ad quodvis datum tempus invenire. Copern. lib. 4. cap. 4.

Æqualis motus anomaliæ Lunaris, ſive Epicycli primi annuus eſt — 1ˢ. 19ˢ. 28. gr. 43′. 9″. 7‴. 15⁗.
diurnus — 13. 3. 53. 57. 1.
horarius — — 32. 39. 44. 52.

Et fuit tempore N. C. 3ˢ. 27. gr. 7′.

Hinc pro tempore dato motus æqualis anomaliæ lunaris colligitur hoc modo:

I. Sex.

I. Sex. an.

1. — $1^{'''}.19^{''}.28^{'}.43$.gr.$9'.7''.15'''$. — 26.40.

26. 29. 34. 23. 2.25. 0. — 20.20.

6. 37. 23. 35. 45.36.15. — 5.20.

26. 29. 34. 23 2. 25. — 1.

26. 29. 34. 23. 2. 25.

1. 50. 43.13.20.

II. Sex. d. — Sex. d.

1. — $13^{'}$. 3.gr.$53'.57''.1'''$. — 3.35.$35'.6''.20'''$.

39.11. 41.51. 3.

6.31. 56.58.30.30.

1. 5. 19 29 45. 5.

6. 31.56 58 30.

1. 5.19 29.45.

1.18.23 23.

6 31.56.

$4^{'}$.56.gr.$37'.0''.42'''.9''''$. Motus dierum.

1.50. 43.13.20. 0. Motus annorum.

3.27. 7. Radix.

$4^{'}$.14.gr.$27'.14''.2'''.9''''$. Motus æqualis anomaliæ lunaris ad tempus ſupra datum.

PROBLEMA TERTIUM.

Æqualem motum epicycli ſecundi, nempe puncti E, verſus L. reperire.

Æqualis motus epicycli ſecundi, ut in Protheoria dixim⁹, eſt ad æqualem motum Lunæ duplus. Atqui æqualis motus Lunæ ad tempus ſupra datum erat,

$5^{'}$.54.gr.$49'.27''.38'''.45''''$.

 Ergo

Ergo æqualis motus epicycli ſecundi ab E in L, ad tempus ſupra datum, abjectis integris circulis, eſt.

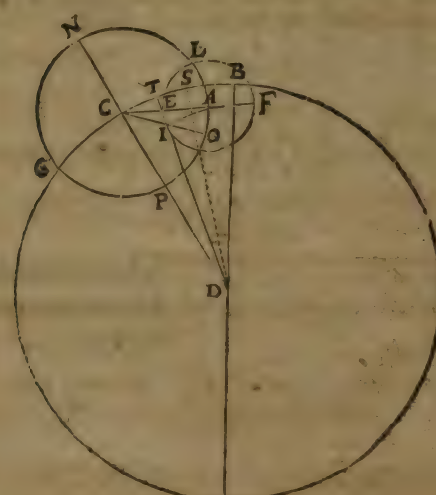
5.49.gr.38′.55″.17‴.30⁗.

Id eſt:

349.gr.38′.55″.

PROBLEMA QUARTUM.

Proſthaphæreſes epicycli ſecundi ſupputare. Copern. lib. 4. cap. 11.



Proſthaphæreſis epicycli ſecundi, exempli gratia, eſt angulus ACI vel ACO, ad quem inveniendum præter æqualem motum puncti E, unde innoteſcit angulus EAI, prorſus ut in Sole, hæc duo requiruntur.

1. Notitia mediæ eccentricitatis Lunæ, ſive notitia radii epicycli primi CA.

2. Noti-

2. Noticia differentiæ inter mediam & maximam eccentricitatem Lunæ, sive notitia radii epicycli secundi AF, vel AE, vel AI.

Statuit autem Copernicus maximam eccentricitatem Lunæ, sive rectam CF, esse partium 1334 qualium DC, sit 10000. Minimam verò eccentricitatem, sive rectam CE esse partium earundem 860. Est ergo media eccentricitas CA, partium 1097. differentia inter maximam & mediam eccentricitatem AF, vel AE, vel AI. partium 237.

Quibus ita hoc loco sumtis (demonstrationes enim Copernici huc transcribere nimis prolixum foret) in Triangulo CAI, nota sunt duo latera CA, & AI, includentia angulum notum CAI. Solvo igitur Triangulum CAI, per axioma 3. planorum hoc modo.

CA,	1097.	Motus ELFI, 349. gr. 39'. per probl. 3.
AI,	237.	Compl. IE, vel IAE, 10. 21.
Summa	1334.	Summa angulorum A, & C, 169. 39.
Differentia	860.	Dimidium summæ 84. 49. 30".

Ut summa laterum CA, & AI, ad differentiam eorundem,

1334. 860.

Ita tangens 84. gr. 49'. 30".

110415249.

Ad 71182244. tangentem anguli 82 gr. 0'. 11". quo sublato de angulo 84. gr. 49'. 30". relinquitur angulus, quæsitus ALI, 2. gr. 49'. 19". qui angulus quia consistit citra medium motum epicycli primi, sive puncti A, idcirco est ab eodem medio motu auferendus: & hic, & in toto semicirculo posteriore FIE. At in semicirculo priore ELF, esset ad medium motum addendus.

Atqui medius motus epicycli primi supra inventus.

NGA, erat — 254. 27'.14".

Ergo si inde auferas ECI, sive OA, 2.gr.49.19.

Relinquitur verus motus
epicycli primi NGO. 25. 37.55".

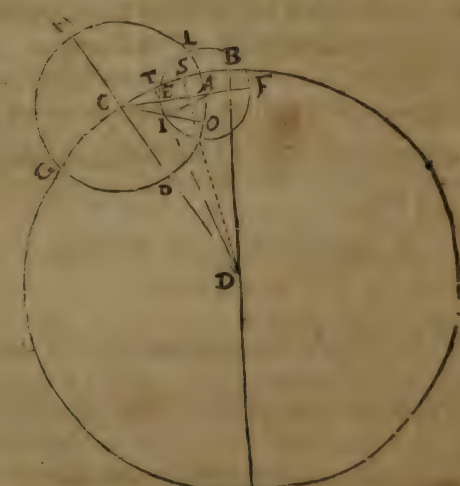
Ejusque complementum ad integrum circulum ON, 108. gr. 22'. 5".

Et hujus complementum ad semicirculum OP, 71.37.55".

PROBLEMA QUINTUM.

Eccentricitatem Lunæ, sive quantitatem radii epicycli primi ad datum tempus invenire.

Eccentricitas Lunæ ad datum supra tempus erit recta CI.



Iam in Triangulo CAI, per problema præcedens noti sunt omnes anguli, & præterea latera duo CA, & AI. Igitur inde

inde colligo latus tertium: per 2. axioma Triangulorum planorum hoc modo.

Ut ACI, 2. grad. 49'. 19". ad AI, ita CAI, 10. 21.

492323. 237. 1796607.

Ad CI, 865. ferè.

PROBLEMA SEXTUM.

Prosthaphæreses epicycli primi supputare.

Prosthaphæresis epicycli primi, verbi gratia, est angulus CDI, qui angulus & ipse reperitur per axioma 3. hoc modo.

In Triangulo CDI, nota sunt:

1. Latus CD, 10000.

2. Latus CI, 865. per problema 5.

eorumq; summa 10865.

Et differentia 9135.

3. Angulus DCI, 71. grad. 37'. 55". ferè per problem. 4.

Et reliquorum duorum summa 108, 22. 5".

ejusque summæ dimidium 54. 11. $2\frac{1}{2}$.

Dico igitur:

Ut summa CD, & CI, ad differentiam: ita tangens 45. gr. 11'. $2''\frac{1}{2}$.

10865.	9135.	13857198.

Ad 11650759 tangentem anguli 49. gr. 21'. 36". quo sublato de angulo 54. gr. 11'. $2''\frac{1}{2}$. relinquitur angulus CDI, 4. gr. 49'. $26''\frac{1}{2}$. qui angulus, quoniam ultra lineam medii motus Lunæ CD consistit, ideo est ad medium illum Lunæ motum addendus: ut semper in semicirculo posteriore PLN. Auferendus autem esset, in semicirculo priore NGP, quia tunc citra lineam medii motus Lunæ CD, consisteret.

Medius motus Lunæ. 354. gr. 40'. $27''\frac{1}{2}$. per probl. 1.

Prosthaphæresis addenda. 4. 49. $26\frac{1}{2}$.

Summa 359. 38. 54. Verus motus Lunæ à medio loco Solis, ad tempus supra datum.

Cui si adjeceris medium motum Solis ab æquinoctio verno 107. grad. 56'. $37''\frac{1}{2}$. & de summa integrum circulum, nempe 360. gr. abjeceris, habebis verum locum Lunæ ab æquinoctio verno 107. gr. 35'. $31''\frac{1}{2}$.

PRO-

PROBLEMA SEPTIMUM.

Motum latitudinis Lunæ ad quodcunq; datum tempus invenire. Copern. lib.4. cap.4.

Motus latitudinis Lunæ revera nihil aliud est, quàm motus nodorum Eclipticæ & circuli obliqui Lunæ, contra ordinem signorum: prorsus, ut motus præcessionis Æquinoctiorum. Sed Copernicus pro motu nodorum contra ordinem Signorum, ad calculum assumit distantiam Lunæ à boreo limite maximæ latitudinis secundum ordinem signorum, & istam distantiam vocat motum latitudinis Lunæ. Quæ distantia, quia nihil aliud est, quam arcus ex motu nodorum & medio motu longitudinis Lunæ compositus, ideo illi perinde ut medio motui longitudinis Lunæ, prosthaphæresis longitudinis Lunæ, sive prosthaphæresis epicycli primi Lunæ est vel addenda, vel demenda.

Cæterùm, motus nodorum contra ordinem signorum annuus est, 19. gr. 5'. 22''. 41'''. Motus autem longitudinis Lunæ annuus est. 2. 9. gr. 57'. 22''. 36'''.

Hinc componitur motus latitudinis Lunæ annuus
2. 28 gr. 42'. 45''. 17'''. 2''''. & inde
elicitur motus diurnus 0. 13. 13. 45. 39. 29.
& motus horarius 33. 4. 24. 8.

Radix autem illius motus tempore Nativitatis Christi fuit 2. 9. gr. 45'.

Ad tempus igitur supra datum motus medius latitudinis Lunæ colligitur hoc modo, & talis invenitur, ut sequitur.

1. Sex.

1. Sex. — 2''. 28'. 42 gr. 45'. 17''. 21'''. — 26. Sex. 40. Anni.

49. 34. 15. 5. 47. 0. 20. 20.
12. 23. 33. 46. 26. 45. 5. 20.
49. 34. 15. 5. 47.
49. 34. 15. 5. 47.

Sex. 5. 40. 7. 42. 40. Sex. D.
1. — 13'. 13. gr. 45'. 30''. 29'''. — 3. 35. 35'. 6''. 20'''.

39. 41. 16. 58. 27. 30. 30.
6. 36. 52. 49 44. 30. 5. 5.
1. 6. 8. 48. 17. 25.
6. 36. 52. 49. 44.
1. 6. 8. 48. 17.
1. 19. 22. 33.
4 24. 34.

5'. 32. gr. 3'. 1''. 54'''. 3''''.		Motus dierum.
5. 40.	7. 42. 40. 0.	Motus annorum.
2. 9.	45.	Radix.
1. 21.	55. 44''. 34. 3.	Summa.

Æqualis motus latitudinis Lunæ, ſive, media diſtantia Lunæ, à limite boreo maximæ latitudinis, ſecundum ordinem ſignorum. Cui motui ſi addideris proſthaphæreſin longitudinis Lunæ 4. gr. 49'. 26''$\frac{1}{2}$. habebis veram diſtantiam Lunæ à boreo limite maximæ latitudinis, ad tempus ſupra datum 86. gr. 45'. 11''. Ex qua diſtantia liquet, Lunam adhuc eſſe in latitudine borea: & diſtare à cauda Draconis, gradibus 5. ſcrupulis 14'. 49''.

PROBLEMA OCTAVUM.

Ipſam latitudinem Lunæ ſupputare.

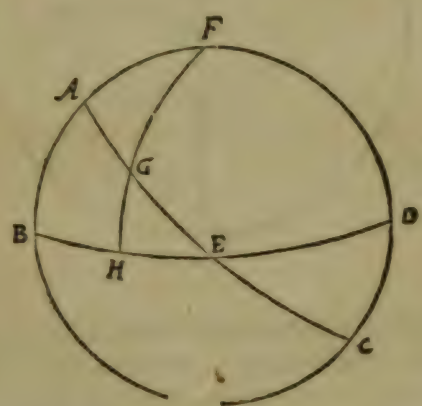
Fit hæc ſupputatio prorſus, ut ſupputatio declinationum Solis, compendioſiſſimè per axioma quartum, hoc modo:

Compl.

Compl.maximæ latitud.	85.gr.	0'. 0".	85. 0. 0".	
Motus latitudinis	86.	45'.11".	3.14.49".	
	171.	45.11".	88.14.49.	— 9995320.
Exc.81.		45.11'.	— —	9896590.
				98730.
				49365.

Sinus arcus 0. gr. 16'. 58". qui arcus eſt ipſa latitudo Lunæ, ad tempus ſupra dictum.

Quod ſi quis axiomate quarto uti nolit, utatur primo, vel tertio hoc modo.

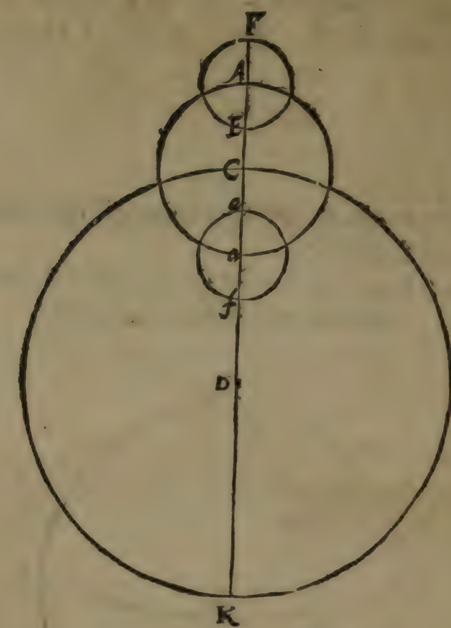


Ut EA, quadrans ad AB, maximam latitudinem Lunæ 5. gr. ita EG. diſtantia à cauda Draconis, ſive complementum motus latitudinis, ad GH. latitudinem, per ax.1. vel

Ut GHE, ad GE, ita GHE, ad GH, &c. per axiom. 3.

PROBLEMA NONUM.

Diſtantiam Lunæ à centro terræ ſupputare. Cop. lib 4. cap. 17.



Distantia Lunæ à centro terræ media DC, secundum Copernicum est semidiametrorum terræ 60. scr. 18. Hinc cæteræ distantiæ Lunæ à centro terræ, ita supputantur.

Si Luna sit in linea medii motus Solis, sive circa punctum C, sive circa punctum K, & primum, si consistat ad F. Dico:

Ut DC, 10000. ad DC, 60. 18'. semid. ita CF, 1334. per probl. 4.

Ad CF, 8. 2'. semid. terræ: quibus additis ad DC, 60. 18. efficitur DF, 68. 20'.

Deinde, si consistat ad E. Dico:

Ut DC,

Ut DG, 10000. ad DC, 60. 18'. ſemid. ita CE, 860. per probl. 4.

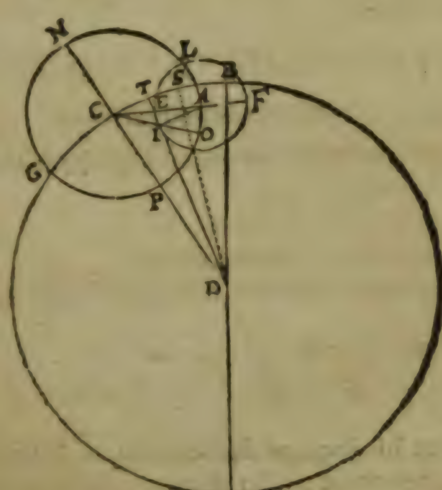
15.

3.

Ad CE, 5. 11'. ſemid. terræ, quibus additis ad DC, 60. 18', efficitur DE, 65. gr. 29'. ſemid. terræ.

Porrò, ſi conſiſtat ad E.

Ablata recta EC, quæ eſt æqualis rectæ CE. 5. 11'. ſemid. de recta DC, 60. 18'. relinquit rectam DE, 55. gr. 7'. ſemid. Deniq; ſi conſiſtat ad F.



Ablata recta CF, quæ eſt æqualis rectæ CF, 8. gr. 2'. ſemid. de recta DC, 60. gr. 18', relinquit rectam DF, 52. gr. 16'. ſemid. Si vero Luna non ſit in linea medii motus Solis, diſtantia ejus à centro terræ ita ſupputatur.

EXEMPLI gratia: ad tempus ſupra datum, in Triangulo CDI, angulus ICD, 71. gr. 37'. 55''. per probl. 4. CDI, 4. gr. 49'. 26''½. per probl. 6.

Summa utriusq; anguli 76.gr.27'.21''½. Et illius summæ cõplementum ad duos rectos CID, 103. gr. 32'. 38''½. Sed cujus idem est sinus, qui complementi sui 76.gr.27'.21''½. per 7.p.2.

Dico igitur:

Ut CID, 76.gr.27'.21''½. ad CD, semi.terræ, ita ICD, 71.gr.37'.55''.

Sin.9721896.	60.18.	Sin.9490519.
	15.	
	3.	

Ad ID, 58. gr. 52'. semid. terræ: quæ tum erit distantia Lunæ à centro terræ.

PROBLEMA DECIMUM.

Parallaxes Lunæ supputare.

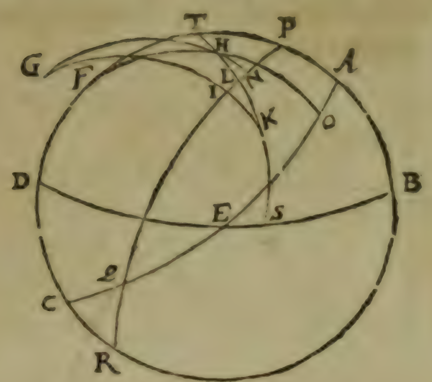
Hîc prorsus, ut in parallaxibus Solis supputandis, duo præcognoscenda sunt:

1. Distantia Lunæ à vertice.
2. Distantia Lunæ à centro terræ.

Distantia Lunæ à vertice, si non sit in ipso horizonte, sic reperitur.

Primum recolligo longitudinem Lunæ: quæ tempore supra dato erit 107. gr. 35'. 31''½. Et latitudinem: quæ tum erit 0. gr. 16'.58''.

Deinde ex his inquiro declinationem & ascensionem rectam Lunæ, per probl.15.lib.1. & invenio declinationem Lunæ 22.gr.35'.20''. & ascensionem rectam 109.grad.9'.55''. Postea ascensionem rectam, 109. gr. 6'. 32''. nempe in adjuncto Schemate arcum QO, compono cum arcu CQ. noto ex problemate 13. libri præcedentis 55.gr.18'.20''. Et fit arcus CO, 164.gr. 24'.52''. cujus complementum ad semicirculum est arcus OA, 15.gr.35'. 8''. Qui arcus est mensura anguli TFH. Quo noto, quia etiam latera ipsum includentia FT, (complementum eleva-



levationis poli) & FH, (complementum declinationis Lunæ) nota sunt, inquiro complementum altitudinis Lunæ, sive distantiam Lunæ à vertice TH, per ax. 4. hoc modo.

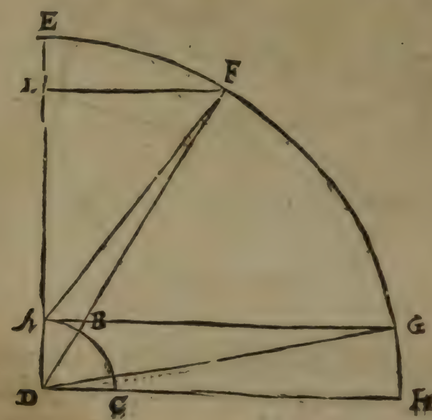
FT, 40.25.	—	40.25.		
FH. 67.24'.40".	—	22.35.20".		
107.49.40.		63. 0.20.	—	8910505.
Exc. 17.49.40.	—	—	— — —	3061569.
				11972074.
TFH, 15.gr.35'. 8".		1000000.		5986037.
74. 24.52.		9632303.		
		367697.		

Ut 10000000. ad 5986037. ita 367697. ad 220104. quo detracto de 8910505. relinquitur 8690401. sinus altitudinis Lunæ HS, 60.gr.20'.50". cujus compl. TH, 29. gr. 39'. 10". est distantia Lunæ à vertice.

Distantia Lunæ à centro terræ ad tempus supra datum erit 85.gr.52'. semidiametrorum terræ: per problema præcedens.

His duobus ita præcognitis parallaxes Lunæ non aliter

quàm parallaxes Solis supputantur, nempe maxima quidem parallaxis per axioma 1. hoc modo.



Ut GD, 58. 52. sem. terræ, ad DA, 1. sem. ita GD, rad. 10000000.

3532. scr. 60, scr.

Ad DA, 169875. sinum anguli AGD, 58'. 24",

Cæteræ verò, vel per axioma 3. hoc modo.

AD, 1. semid.	EDF, 29. gr. 39'. 10".
DF, 58. gr. 52'. semid.	A & E, 150. 20. 50".
Summa 59. 52. semid.	Dimid. 75. 10. 25".
Diffe. 57. 52. semid.	Tangens — 377861.

Ergo:

Ut 59. gr. 52'. semid. ad 57 gr. 52'. semid. ita tang. 37778020.

3592. scr. 3472.

Ad 36515248. tangentem anguli 74. gr. 41'. 5" ½. quo detracto de angulo 75. gr. 10', 25", relinquitur angulus AFD, 0. gr. 29'. 19" ½. parallaxis Lunæ ad tempus supra datum.

Vel

Vel per axioma primum: hoc modo:

EDF,29.gr.39'.10''. Sinus LF, 4947426.

Sinus complementi LD, 8690396.

Sinus maximæ parallaxeos AD, 169875. Subtrahe.

AL,8520521.

Ut AL,8520521. ad LF,4947426.ita AL, 10000000 ad LF, 5806483. Tangentem anguli LAF,30.gr.8'. 29''½. De quo detractus angulus EDF, 29.gr.39'. 10''. relinquit angulum parallacticum AFD. 0.gr.29'.19''½.

PROBLEMA UNDECIMUM.

Quomodo parallaxis Lunæ longitudinem, vel latitudinem ejus mutet, ostendere. Cop. lib 4.cap.26.

¶ Si verticalis per Lunam transiens sit ipse Signifer, tota parallaxis ut Solis, ita etiam Lunæ, in longitudinem transit: eamq; minuit in quadrante occidentali, auget in quadrante orientali.

¶ Si verticalis per Lunam transiens sit Signifero rectus, tota parallaxis in latitudinem transit, & latitudinem quidem austrinam facit majorem, boream vero minorem.

¶ Si verticalis per Lunam transiens sit Signifero obliquus, parallaxis Lunæ partim longitudinem, partim latitudinem ejus mutat. Causa patet ex ijs, quæ de parallaxibus Solis diximus.

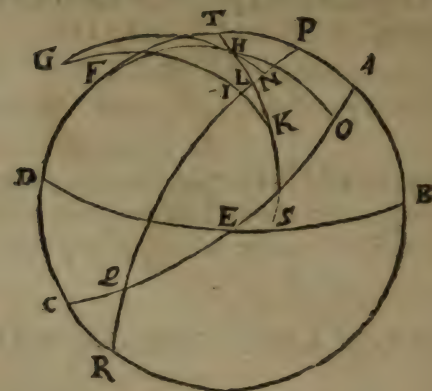
¶ An autem verticalis per Lunam transiens sit Signifero rectus, vel obliquus, facilè sciri potest. Nam per 13. probl. præcedentis, & per 10 problema hujus jam nota sunt.

1. Omnia latera Trianguli TFH, & præterea angulus TFH.

2. Totum Triangulum QCR.

3. In Triangulo TLP, latus TP, & angulus LPT.

Diço



Dico igitur in Triangulo TFH.

I. Ut TH. *29*. gr. *39'*. *10''*. ad TFH, *15*. gr. *35'*. 8''. ita FH, *67*. gr. *24'*. *40''*.

4947426. *2686769*. *9232847*.

Ad 5014027. sinum anguli FTH, qui idem est sinus anguli LTP, *30* gr. *5'*. *34''*.

II. In Triangulo LTP, inquiro angulum TLP, per axioma quartum, hoc modo:

LTP, 30. gr. 5'. 34''. — *30. 5'. 34''*.
TPL, *76*. 53'. 55''. — *13. 6. 5''*.

106. 59'. 29''. — *43. 11. 39*. — 6844729.
Exc. *16*. *59. 29*. — — 2922280.

9767009.
4883504.

TP, 29. 56'. 22''.
Compl. 150. 3. 38. | 10000000.
Exc. 60. 3. 38. | 8665533.

Sinus versus. 1866553 3. Vel enim angulus LPT, vel angulus TLP, est maximus. Alioqui Triangulum LTP, haberet tres duobus

duobus rectis minores, quod est impossibile, per 47. p. 1. Si angulus TLP, est maximus pro latere TP, maximo est assumendum ipsius complementum ad semicirculum, per 61. p. 1. Si angulus LPT, est maximus pro angulo LPT, est assumendum ejus compl. ad semicirculum, per eandem. Quo facto, habetur Triangulum unius lateris quadrante majoris. Pro quo si solvas Triangulum illi adjacens, quod habeat utrumq; latus quadrante minus, pro latere TP, quadrante minore, dabitur tibi angulus quadrante maior. Qua de re vide Trig. pag. 143.

Ergo:

Ut *10000000.* ad *4883504.* ita 18*665533.*

Ad *9115320.* unde subtractus sinus *6844729.* relinquit *2260591.* sinum arcus 13 gr. 3'. 54''. qui est excessus tertii lateris supra quadrantem: cujus excessus complementum ad quadrantem *76.* grad. 56'. 6''. est mensura anguli TLP, quæsiti. Unde liquet, verticalem TL, in hoc exemplo Signifero PL, non esse rectū.

Quia igitur verticalis TL, Signifero PL, nō est rectus, ideo parallaxis Lunæ partim longitudinem, partim latitudinem ejus mutat. Longitudinem Lunæ minuit arcu IN, latitudinem ex borea HN, facit austrinam IK. Qui duo arcus IN, & IK, porro reperiuntur hoc modo.

I. Ut HLN, *76.* gr. 56'. 6''. ad HN, latitud. *16'. 58''.* ita HNL.

9741142.	*49353.*	*10000000.*

Ad 50664. sinum arcus HL, 17'. 25''. qui arcus demtus de parallaxi HK, 28'. 53''. relinquit arcum KL *11'. 54''* ½. per ax. *3.*

II. Ut LIK, rad. ad LK, 11'. 54''½. ita ILK, *76.* gr. 56'. 6''.

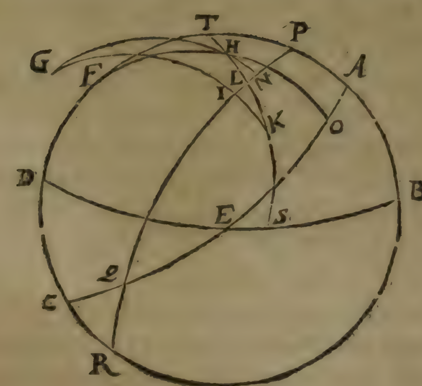
10000000.	*34640.*	*9741142.*

Ad *33743.* sinum arcus IK, *11'. 32''* ½. quæ erit latitudo Lunæ visa austrina, tempore supra dato per ax. *3.*

III. Ut KLI, *76.* gr. 56'. 6''. ad rad. ita KI, *11'. 6''.*

Tang. *43091672.*	*10000000.*	tang. *33743.*

Ad 7830. sinum arcus IL, 2'. *41''* ½. per ax. *2.*



IV. Ut HLN, 76. gr. 56′. 6″. ad radium.
Tang. 43091672. 10000000.
Ita HN, 16′. 58″.
Tang. 49354.

Ad 11453. ſinum arcus LN, 3′. 56″. per ax. 2: Qui arcus LN, 3′. 56″. compoſitus cum arcu IL, 2′. 41″. $\frac{1}{2}$. efficit arcum IN, 6′. 37″ $\frac{1}{2}$. qui arcus detractus ab arcu QN, hoc eſt, à vera longitudine Lunæ 107. gr. 35′. 31″. $\frac{1}{2}$. relinquit longitudinem Lunæ viſam 107. gr. 28′. 54″. quæ ablata à longitudine Solis viſa 107. gr. 56′. 19″ $\frac{1}{2}$. relinquit viſam diſtantiam Lunæ à Sole ad tempus ſupra datum 27′. 25″ $\frac{1}{2}$.

PROBLEMA DUODECIMUM.

Data vera diametro Lunæ, unà cum diſtantia à centro terræ, apparentem ejus diametrum invenire.

Vera ſemidiameter Lunæ ſecundum Copernicum eſt ſemidiametrorum terræ 0. ſcr. 17′. 9″. Diſtantia Lunæ à centro terræ ad tempus ſupra datum, erit 58. ſemid. terræ & 52. ſcrupulorum per probl. 9. Hinc apparens ſemid. ameter Lunæ ita ſupputatur.

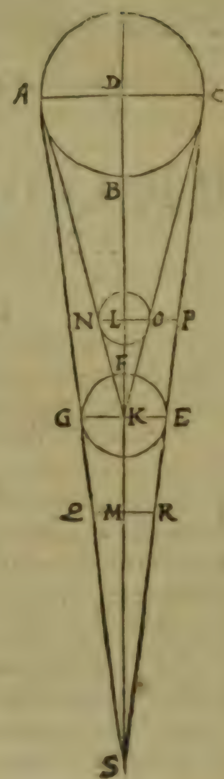
Ut

Ut KL, 58. gr. 52'. sem. ad LO, 17'. 9''. s.

211920, 1029. scr. 2.

Ita KL, 10000000.

Ad LO 48556 tangentē anguli LKO vel DKC, 16'. 41'$\frac{1}{2}$. qui est apparens semidiameter Lunæ. Cujus duplum 33'. 23''. est apparens diameter Lunæ ad tempus supra datum.



PROBLEMA XIII.

Apparentem diametrum umbræ, quam Sol spargit à terra, in Luna transitu, reperire.

Eclipses nostri seculi ostendunt semidiametrum Lunæ LO, esse ad semidiametrum umbræ MR, ut 150. ad 403. ut refert Copernicus lib. 4. c. 19. Hinc semidiameter umbræ, quâ Luna transit, nempe recta MR, ita reperitur.

Ut 150. ad 403. ita LO, 16'. 41'$\frac{1}{2}$.

per probl. 12. Sin. 48556.

Ad MR, 1303. sinum arcus, vel anguli 44'. 51''.

F I N I S.

BARTHOLOMÆI PITISCI
Grunbergensis

PROBLEMATUM ASTRONOMICORVM

Liber Sextus.

De calculo Eclipsium.

PROTHEORIA.

Eclipsis dicitur obſcuratio Solis vel Lunæ. Obſcuratio Solis eſt interceptio luminis Solis, facta à Luna inter Solem & viſum noſtrum diametraliter interpoſita. Obſcuratio Lunæ eſt defectus luminis Lunæ, quem defectum Luna patitur, quando terra inter ipſam & Solem diametraliter interponitur, & ſic Luna in umbram terræ incurrit. Omnis igitur Eclipſis Solis, fit in conjunctione: Lunæ, in oppoſitione Solis & Lunæ. Sed non in omni conjunctione, vel oppoſitione Solis & Lunæ fit Eclipſis: quia Sol & Luna non ſemper diametraliter opponuntur, aut conjunguntur, propter latitudinem Lunæ: ſive propter evagationem Lunæ ab Ecliptica. Ad Eclipſes itaq; ſupputandas, & conjunctiones, vel oppoſitiones luminarium indagare, & latitudinem Lunæ circa id tempus inveſtigare oportet. Atq; hæc omnia ſecundum veritatem in Eclipſibus Lunaribus: ſecundum viſum in ſolaribus: quia Sol per ſe

per ſe non obſcuratur, ſed viſus tantùm noſter impeditur, quò minus lumen Solis videat. Luna autẽ per ſe obſcuratur. Hæc cauſa eſt, cur in Eclipſibus Solis parallaxeon tàm Solis, quàm Lunæ, tàm accurata ratio habenda ſit: in Eclipſibus Lunæ nulla. De his igitur, & quæ præterea ad calculum Eclipſium pertinent, paucula quædam problemata quaſi coronidis vice cæteris adjungemus.

PROBLEMA PRIMUM.

Tempus mediæ conjunctionis, vel oppoſitionis Solis & Lunæ reperire. Copern. lib. 4. c. 28.

Ad tempus propinquum, quod ex jam factis conjunctionibus & oppoſitionibus Solis & Lunæ facile conjicies, inveſtiga motum Lunæ à Sole æqualem. Qui ſi integrum circulum cõplevit, erit conjunctio media: ſi ſemicirculum tantum, erit oppoſitio media. Si neq; circulum neq; ſemicirculum exactè complevit: ſed vel major eſt, vel minor: tantum temporis tempori ſumto addes, vel ſubtrahes, quantum diſtantiæ Lunæ à Sole competit. Exempli gratia. Anno 1600. menſe Iunio continuata novilunia & plenilunia oſtendunt fore novilunium, hoc eſt, conjunctionem Solis & Lunæ triceſima die Iunii poſt meridiem. Ergo ad tempus propinquum, verbi gratia, ad horam ſecundam P. M. inquiro motum Lunæ à Sole æqualem & invenio

5ˢ. 54. gr. 49′. 27″.

Huic motui æquali deſunt ad integrum circulum

5. gr. 10′. 33″.

Conficiet autem Luna hunc curſus ſui defectum horis 10. ſcr. 1′. 8″.

Nam motus Lunæ horarius eſt

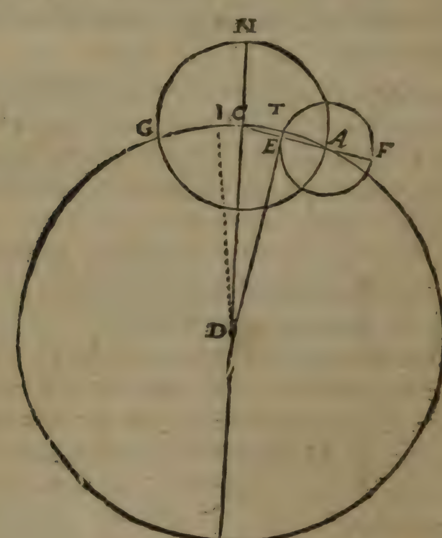
30′. 28″.

Ut autem 30'.28". ad unam horam: ita 5. gr. 10'.33". ad 10. horas, ſcr. 11'.32".

Ergo tempori ſupra dato, ſi addidero 10. horas ſcr. 11'. 32". Conjunctio Solis & Lunæ media erit, Anno 1600. triceſima Iunii, hora uſuali 12. ſcr. 11'. 32". P. M. ſub Meridiano Cracovienſi.

PROBLEMA SECUNDUM.

Tempus veræ conjunctionis, vel oppoſitionis Solis & Lunæ reperire. Copern. lib. 4. cap. 29.



Primùm, ad tempus mediæ conjunctionis, vel oppoſitionis Solis & Lunæ, quære eorum proſthaphæreſes: & erunt in exemplo noſtro.

Proſthaphæreſis Solis ablativa quaſi angul[9] IDC, 0. gr. 17'.1".

Proſthaphæreſis Lunæ additiva quaſi angulus CDE, 4. gr. 54'.51".

Deinde

Deinde prosthaphæreses, si sint diversi generis, mutuò junge: si sint ejusdem generis, minorem à majore subtrahe, ut appareat vera distantia Lunæ à Sole. Ut, in nostro exemplo, prosthaphæreses sunt diversi generis: nempe altera ablativa, altera additiva. Iungo igitur.

ICD, 0. gr. 17′. 1″.
CDE. 4 gr. 54. 51.
———————
5. gr. 11′. 52″.

Et evadit angulus IDE, sive arcus 5. gr. 11′. 52″. quo angulo, vel arcu in media conjunctione Luna distabit à Sole, & prætergressa erit Solem.

Tertiò, ex distantia Lunæ à Sole, probabiliter collige, quot horis vera conjunctio mediam antecedat, vel sequatur: hoc modo.

1. Gradus cursus ☾, à ☉, dat horas fermè duas: quot horas dabunt 5. gr. 11′. 52″. ℞. 10 hor. scr. 23′. 44″.

Quartò, has horas 10. scr. 23′ 44″. (quia vera conjunctio mediam præcessit: quod ex prosthaphæresibus apparet,) subtrahe à tempore mediæ conjunctionis, hoc modo.

12. h, 11′. 32″.
10. h, 23. 44.
———————
1. h, 47′. 48″.

Et evadet tempus æstimatum veræ conjunctionis Solis & Lunæ, 1. h 47′. 48″. P.M.

Quintò, ad tempus æstimatum veræ conjunctionis Solis & Lunæ quære vera loca Solis & Lunæ: ut appareat, an illa loca coincidant, an verò adhuc luminare alterum ab altero distet. Ut in nostro exemplo, ad tempus æstimatum veræ cōjunctionis verus loc⁹ Solis ab æquinoctio verno erit 107. gr. 50′. 4″. Verus locus Lunæ ab eodem æquinoctio verno erit 107 gr. 29.′ 19″. Jam locus Lunæ subtractus à loco Solis relinquit differentiā 20′ 45″. Distabit igitur tum adhuc Luna à Sole scrupulis 26′ 45″.

Sextò,

Sextò, verum locum Lunæ collige etiam ad tempus problemate primo assumtum: & differentiam temporis atq; motuum nota hoc modo.

Verus motus ☾.

Hora 2. scr. 0'. 0".	—	107. gr. 35'. 31".
Hora 1. scr. 47. 48.	—	107. 29. 19.

Differentia temporum 12'. 12". Diff. motuum 0. 6. 12".

Septimo, ex hac utraq; differentia, quanto tempore Luna, residua ista scrupula 26'. 45". conficere, & ad Solem pervenire possit, collige hoc modo.

Ut 6'. 12". scr. graduũ ad 12'. 12". scr. hor. ita 26'. 45". scr. gr..

372". 732". 1605".

Ad 52'. 38". scrupula horaria.

Octavò, hæc scrupula horaria 52'. 38". adde ad tempus æstimatum veræ conjunctionis, & habebis absolutum tempus veræ conjunctionis: hoc modo.

Tempus æstimatum veræ ☌	—	hor. 1. scr. 47'. 48".
Defectus	— —	hor. 0 scr. 52. 38.
Tempus veræ ☌ Cracoviæ	—	hor. 2. scr. 40. 26. P. M.
		59. 0.
Idem tempus, Heidelbergæ	—	hor. 1. scr. 41. 26. P. M.

PROBLEMA TERTIUM.

Tempus visæ conjunctionis Solis & Lunæ reperire. Cop. lib. 4. c. 31.

Primùm, inquire visam Lunæ à Sole distantiam, tùm ad tempus veræ conjunctionis, tùm ad horam præcedentem in quadrante Signiferi orientali, vel ad horam sequentem, in quadrante Signiferi occidentali, per problema 11. libri. 5.

Deinde distantiam minorem subducà majore, vel si altera distantia citra, altera ultra Solem consistat, mutuò junge, & habebis

habebis visibilem Lunæ motum à Sole, competentem illi horæ, in qua tum sit motus.

Tertio sic ratiocinare.

Ut visibilis Lunæ motus horarius ad 1. horam:

Ita visibilis Lunæ distantia à Sole, tempore veræ conjunctionis, ad hor. — scr. —

Quartò has horas, vel hæc scrupula horaria adde ad tempus veræ conjunctionis, in quadrante Signiferi occidentali: vel ab eodem tempore aufer, in quadrante Signiferi orientali, & habebis tempus visæ conjunctionis.

EXEMPLUM. Tempore veræ conjunctionis Solis & Lunæ, Anno 1600. die 30. Iunii, hora 1. scr. 41'. 26". P.M. respectu Meridiani Heidelbergensis visa Lunæ à Sole distantia erit circiter 5'. 20". citra Solem hor. 2. scr. 41'. 26". P.M. visa Lunæ à Sole distantia erit circiter 24'. 18". ultra Solem. Summa utriusq; distantiæ est 29'. 38".

Iam

Ut 29'. 38". scr. graduum	ad 1. horam,	ita 5'. 20". scr. gr.
1778".	3600".	320".

Ad 10'. 48". scrupula horaria: quæ addita ad tempus veræ conjunctionis, Heidelbergæ efficiunt tempus visibilis conjunctionis 1. horam 52'. 14". P.M.

PROBLEMA QUARTUM.

Visam latitudinem Lunæ à Sole ad tempus visæ conjunctionis invenire.

Primùm, quære verum motum latitudinis Lunæ ad tempus visæ conjunctionis per problema 7. lib. 3.

Et erit in nostro exemplo circiter 87. gr. 56'. 24".

Deinde, ex vero motu latitudinis inquire veram latitudinem Lunæ per probl. 8. lib. 5. & erit in nostro exemplo circiter 12'. 15".

Tertiò, ad idem tempus inquire parallaxes Solis & Lunæ, per probl. 12. lib. 4. & 10. lib. 5. Et erit in nostro exemplo parallaxis Solis circiter 1'. 32''. Lunæ, circiter 35'. 27''.

Quartò, per problema 13. lib. 4. & per 11 lib. 5. inquire, quid de parallaxi Solis, vel Lunæ, in latitudinem transeat. Et invenies in nostro exemplo de parallaxi Solis transire in latitudinem circiter scrupula 1'. 25''. De parallaxi Lunæ, circiter scrupula 34'. 20''.

Quintò de parallaxi latitudinis Lunæ subtrahe inventam antea latitudinem Lunæ boream 12'. 15''. & restabit visa latitudo Lunæ australis, ab Ecliptica 22'. 5''.

Sextò, à visa latitudine Lunæ australis, ab Ecliptica, subtrahe visam latitudinem Solis, quæ itidem est australis 1'. 25''. & restabit visa latitudo Lunæ à Sole 20'. 40''.

PROBLEMA QUINTUM.

Conjunctiones Solis & Lunæ eclipticas ab aliis discernere. Copern. lib. 4. cap. 30.

In Conjunctione.

Si visa latitudo Lunæ à Sole minor fuerit dimidio apparentium diametrorum Solis & Lunæ, Sol subibit Eclipsin: si major, non subibit. Ut Anno N. C. 1600. tricesima die Iunii, hor. 1. scr. 52'. 14''. P. M. (respectu Meridiani Heidelbergensis) ipso momento visæ conjunctionis Solis & Lunæ

apparens semidiameter Solis erit 15'. 55''.
apparens semidiameter Lunæ erit 16'. 42''.

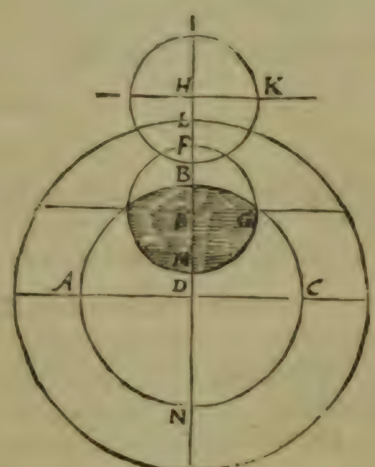
Summa harum duarum semidiametrorum erit 32'. 37''. At visa latitudo Lunæ à Sole erit non nisi 20'. 40''. Ergo Sol tum subibit Eclipsin.

In Oppositione.

Si vera latitudo Lunæ minor fuerit dimidio apparentium diametrorũ Lunæ & umbræ, Luna subibit Eclipsin. Si major, non

non ſubibit. Ut: Anno 1601. die 29 Novembris, hora 7. ſcr. 35'. 46". ſecundum Meridianum Regiimontis in Boruſſia, ad quē Meridianum ſupputatæ ſunt tabulæ Prutenicæ: ſub tempus apparens veræ oppoſitionis Solis & Lunæ, apparens ſemidiameter Lunæ erit 17'. 49". apparens ſemidiameter umbræ 48'. 48". Summa 1. gr 6'. 37". At latitudo Lunæ vera verſus Septentrionem erit non niſi 32'. 12". Ergo Luna tum ſubibit eclipſin.

Majoris perſpicuitatis cauſa res etiam oculis ſubjiciatur.



Sit ergo circulus Solis vel umbræ ABC. Summa ſemidiametrorum Solis & Lunæ, vel umbræ & Lunæ DL, & ſit latitudo Lunæ, primum DH, deinde DE, manifeſtum eſt, ſi latitudo Lunæ ſit DH, nullam fore Eclipſin, Circuli enim IK & BC, nuſquam concurrunt. At ſi latitudo Lunæ ſit DE, fiet Eclipſis, Circuli enim FG, & BC, concurrunt.

PROBLEMA SEXTUM.

Quanta futura ſit Eclipſis, prædicere. Cop. lib. 4. cap. 31.

Latitudinem Lunæ ſubtrahe à ſumma ſemidiametrorum Solis & Lunæ, ſi ſit Eclipſis Solaris, vel umbræ & Lunæ, ſi ſit Eclipſis Lunaris: quod reſtat, converte in digitos eclipticos (ſic vocantur duodecimæ partes diametri Solis, vel Lunæ) hoc modo.

In Eclipſi Solari præcedente:

Summa ſemidiametrorum ☉, & ☾, DL,	32′. 37″.
Latitudo Lunæ DE.	20. 40.
Differentia BM.	11. 57.
Diameter Solis BN.	31. 50.

Ut 31′. 50″. ad 12. dig. ita 11′. 57″. ad digitos 4. ſcr. 30′. 10′.

In Eclipſi Lunari præcedente:

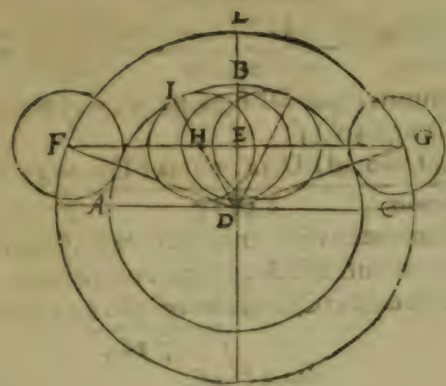
Summa ſemidiametrorum Lunæ & umbræ DL,	66′. 37″.
Latitudo Lunæ DE — —	32. 12.
Differentia.	34. 25.
Diameter Lunæ MF — —	35. 38.

Ut 35′. 38″. ad 12. digitos: ita 34′. 25″. ad digitos 11. ſcr. 35′. 27″.

PROBLEMA SEPTIMUM.

Quandiu duratura ſit eclipſis, oſtendere. Copern. lib. 4. cap. 32.

Sit Ecliptica ADC, ſemidiameter umbræ DB, ſemidiameter Lunæ BL, aggregatum DL, via Lunæ FEG, latitudo Lunæ DE, angulus ad E, quaſi rectus, propter obliquitatem viarum Solis & Lunæ in tam brevi ſpacio inſenſibilem. Dimidium tempus



tempus Eclipſeos FE. Iam in Triangulo DEF, duo latera nota ſunt, DE, latitudo Lunæ & DF. Summa ſemidiametrorum umbræ & Lunæ. Dabitur igitur latus tertium FE, per axiom. 2. planorum, hoc modo.

I. Ut FD, ad FED, ita DE, ad DFE, quo noto notus etiam eſt FDE.

II. Ut FED, ad FD, ita FDE, ad FE, quod diviſum per horariũ motum Lunæ verum, in eclipſi lunari, vel per horarium motum Lunæ viſum, in eclipſi Solari exhibet dimidium tempus eclipſeos, &c.

Eodem modo mora Lunæ in umbra terræ, ſi forte contigerit, ex Triangulo DEH, ſupputabitur, in quo Triangulo latus DE, eſt latitudo Lunæ: latus DH, eſt differentia inter ſemidiametrum Lunæ & umbræ.

Exemplum reale.

In Eclipſi Solari, cujus mentio nuper facta eſt, latitudo Lunæ viſa DE, erit 20′. 40″. Summa ſemidiametrorum Solis & Lunæ FD, 32′. 37″.

Dico igitur.

I. Ut FD, 32'. 37". ad FED, rad. ita DE, 20'. 40".

94875. 10000000. 60116.

Ad 63396. ſinum anguli DFE, 39. gr. 19'. 7". cujus compl. eſt angulus FDE, 50. gr. 40'. 53".

II. Ut FED, rad. ad FD, 32'. 37". ita FDE, 50. gr. 40'. 53".

100000. 94875. 7736343.

Ad 73398. ſinum arcus FE, (nam revera FEG, eſt arcus, etſi hîc curvitas ejus ſit inſenſibilis, propter exiguitatem) 25'. 14".

III. Ut viſibilis motus ☾, horarius 29'. 38". ad 1. horam.

1778".

Ita 25'. 14".

1514".

Ad hor. 0. ſcr. 51'. 5". Cujus temporis duplum eſt 1. h. ſcr. 42. 10". Tanto igitur tempore durabit ſæpe dicta eclipſis Solaris.

Quod ſi etiam initium & finem eclipſeos ſcire cupis: dimidia duratio 51'. 5". ſubtracta à tempore maximæ obſcurationis, initium; addita verò ad id tempus, finem eclipſeos oſtendet: hoc modo.

Tempus maximæ obſcurationis Heidel.	Hor. 1. ſcr. 52'. 14". P. M.
Dimidia duratio	51. 5.
Initium Eclipſeos	hor. 1. ſcr. 1'. 9".
Finis Eclipſeos	hor. 2. 43'. 19".

FINIS PROBLEMATUM ASTRONOMICORUM.

CANON TRIANGVLORVM EMENDATISSIMVS, ET AD VSVM ACCOMMODATISSIMVS;

PERTINENS AD TRIgonometriam

BARTHOLOMÆI PITISCI
GRVNBERGENSIS SILESII.

FRANCOFVRTI
Typis NICOLAI HOFMANNI, sumptibus IONÆ ROSÆ.
ANNO M. DC. XII.

O. Grad. O. Prim.

Secunda	Sinus	1''	Targens	1''	Secans	1''
1	48	49	48	49	100000.00000.12	35
2	97	48	97	48	100000.00000.47	59
3	1.45	49	1.45	49	100000.00001.06	82
4	1.94	48	1.94	48	100000.00001.88	106
5	2.42	49	2.42	49	100000.00002.94	129
6	2.91	48	2.91	48	100000.00004.23	153
7	3.39	49	3.39	49	100000.00005.76	176
8	3.88	48	3.88	48	100000.00007.52	200
9	4.36	49	4.36	49	100000.00009.52	223
10	4.85	48	4.85	48	100000.00011.75	247
11	5.33	49	5.33	49	100000.00014.22	270
12	5.82	48	5.81	48	100000.00016.92	294
13	6.30	49	6.30	49	100000.00019.86	317
14	6.79	48	6.79	48	100000.00023.03	341
15	7.27	49	7.27	49	100000.00026.44	365
16	7.76	48	7.76	48	100000.00030.09	387
17	8.24	49	8.24	49	100000.00033.96	412
18	8.73	48	8.73	48	100000.00038.08	435
19	9.21	49	9.21	49	100000.00042.43	458
20	9.70	48	9.70	48	100000.00047.01	482
21	10.18	49	10.18	49	100000.00051.83	505
22	10.67	48	10.67	48	100000.00056.88	529
23	11.15	49	11.15	49	100000.00062.17	552
24	11.64	48	11.64	48	100000.00067.69	576
25	12.12	49	12.12	49	100000.00073.45	599
26	12.61	48	12.61	48	100000.00079.44	623
27	13.09	48	13.09	48	100000.00085.67	647
28	13.57	49	13.57	49	100000.00092.14	670
29	14.06	48	14.06	48	100000.00098.84	693
30	14.54	49	14.54	49	100000.00105.77	717

89.Grad.59.prim.

Secunda	Sinus	1''	Tangens	1''	Secans	1''
59	99999.99999.88		20626480624.	I in	20626480625.	
58	99999.99999.53	35	10313240312.	secan	10313240313.	10313240312
57	99999.99999.94	59	6875493541.	tibus	6875493542.	3437746770
56	99999.99998.12	82	5156620156.		5156620157.	1788673385
55	99999.99997.06	106	4125296124.		4125296125.	1031324031
54	99999.99995.77	129	3437746770.		3437746771.	687549354
53	99999.99994.24	153	2946640088.		2946640090.	491106681
52	99999.99992.48	176	2578310077.		2578310079.	368330011
51	99999.99990.48	200	2291832179.		2291831181.	286478898
50	99999.99988.25	223	2062648061.		2062648063.	229183118
49	99999.99985.78	247	1875134600.		1875134603.	187513460
48	99999.99983.08	270	1718873383.		1718873386.	156261217
47	99999.99980.14	294	1586652354.		1586652357.	132221029
46	99999.99976.97	317	1473320042.		1473320046.	113332311
45	99999.99973.56	341	1374098706.		1375098710.	98221336
44	99999.99969.91	365	1289155036.		1289155040.	85949670
43	99999.99966.04	387	1213322388.		1213322392.	75832648
42	99999.99961.92	412	1145915587.		1145915592.	67406800
41	99999.99957.57	435	1085604240.		1085604245.	60311347
40	99999.99952.99	458	1031324028.		1031324033.	54280212
39	99999.99948.17	482	982213360.		982213365.	49110668
38	99999.99943.12	505	937567297.		937567303.	44646062
37	99999.99937.83	529	896803503.		896803508.	40763795
36	99999.99932.31	552	859436689.		859436695.	37366813
35	99999.99926.55	576	825059221.		825059227.	34377468
34	99999.99920.55	600	793326174.		793326180.	31733047
33	99999.99914.33	622	763943722.		763943729.	29382451
32	99999.99907.86	647	736660018.		736660025.	27283704
31	99999.99901.16	670	711257948.		711257955.	25402020
30	99999.99894.23	693	687549349.		687549357.	23708598

O.Grad.O.Prim.

Secunda	Sinus	1''	Tangens	1''	Secans	1''
31	15.03	48	15.03	48	100000.00112.9	74
32	15.51	49	15.51	49	100000.00120.3	76
33	16.00	48	16.00	48	100000.00128.0	79
34	16.48	49	16.48	49	100000.00135.9	81
35	16.97	48	16.97	48	100000.00144.0	83
36	17.45	49	17.45	49	100000.00152.3	86
37	17.94	48	17.94	48	100000.00160.9	88
38	18.42	49	18.42	49	100000.00169.7	90
39	18.91	48	18.91	48	100000.00178.7	93
40	19.39	49	19.39	49	100000.00188.0	95
41	19.88	48	19.88	48	100000.00197.5	98
42	20.36	49	20.36	49	100000.00207.3	99
43	20.85	48	20.85	48	100000.00217.3	102
44	21.33	49	21.33	49	100000.00227.5	109
45	21.82	48	21.82	48	100000.00238.0	107
46	22.30	49	22.30	49	100000.00248.7	109
47	22.79	48	22.79	48	100090.00259.6	112
48	23.27	49	23.27	49	100000.00270.8	114
49	23.76	48	23.76	48	100000.00282.2	116
50	24.24	49	24.24	49	100000.00293.8	119
51	24.73	48	24.73	48	100000.00305.7	121
52	25.21	49	25.21	49	100000.00317.8	123
53	25.70	48	25.70	48	100000.00330.1	126
54	26.18	49	26.18	49	100000.00342.7	128
55	26.66	49	26.66	49	100000.00355.5	130
56	27.15	48	27.15	48	100000.00368.5	133
77	27.63	49	27.63	49	100000.00381.8	135
58	28.12	48	28.12	48	100000.00395.3	138
59	28.60	49	28.60	49	100000.00409.1	140
60	29.09	48	29.09	48	100000.00423.1	142

89.Grad.59.Prim.

Secunda	Sinus	1	Tangens	1	Secans	1
29	99999.99887.1	77	665370338.	Vt in	665370345.	22179011
28	99999.99879.3	74	644577514.	secan	644577522.	20792823
27	99999.99872.0	77	625044862.	tibus	625044870.	19532652
26	99999.99864.1	79	606661190.		606661198.	18383672
25	99999.99856.0	81	589328012.		589328021.	17333177
24	99999.99847.7	83	572957789.		572957798.	16370223
23	99999.99839.1	86	557472443.		557472452.	15485345
22	99999.99830.3	88	542802116.		542802125.	14670327
21	99999.99821.3	90	528884112.		528884122.	13918003
20	99999.99812.0	93	515662009.		515662019.	13222103
19	99999.99802.5	95	503084887.		503084897.	12577122
18	99999.99792.7	98	491106675.		491106685.	11978212
17	99999.99782.7	100	479685589.		479685599.	11421086
16	99999.99772.5	102	468783643.		468783654.	10901945
15	99999.99762.0	104	458366229.		458366240.	10417414
14	99999.99751.3	107	448401746.		448401757.	9964483
13	99999.99740.4	109	438861282.		438861294.	9540463
12	99999.99729.2	112	429718339.		429718350.	9142944
11	99999.99717.8	114	420948576.		420948588.	8769762
10	99999.99706.2	116	412529604.		412529617.	8418971
9	99999.99694.3	118	404440791.		404440803.	8088814
8	99999.99682.2	121	396663081.		396663093.	7777710
7	99999.99669.9	123	389178871.		389178884.	7484209
6	99999.99657.3	126	381971855.		381971868.	7207016
5	99999.99644.5	128	375026912.		375026925.	6944943
4	99999.99631.5	130	368330002.		368330016.	6696909
3	99999.99618.2	133	361868072.		361868086.	6461930
2	99999.99604.7	135	355628967.		355628981.	6239105
1	99999.99590.9	138	349601357.		349601371.	6025610
0	99999.99576.9	140	343774667.		343774682.	5826689

O. Grad. 1. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
2	30.06	48	30.06	48	100000.00452.	15
4	31.03	48	31.03	48	100000.00481.	15
6	32.00	48	32.00	48	100000.00512.	16
8	32.97	48	32.97	48	100000.00543.	16
10	33.94	48	33.94	48	100000.00576.	17
12	34.91	48	34.91	48	100000.00609.	17
14	35.88	48	35.88	48	100000.00644.	18
16	36.85	48	36.85	48	100000.00679.	18
18	37.82	48	37.82	48	100000.00715.	18
20	38.78	48	38.78	48	100000.00752.	19
22	39.75	48	39.75	48	100000.00790.	19
24	40.72	48	40.72	48	100000.00829.	20
26	41.69	48	41.69	48	100000.00869.	20
28	42.66	48	42.66	48	100000.00910.	21
30	43.63	48	43.63	48	100000.00950.	21
32	44.60	48	44.60	48	100000.00995.	22
34	45.57	48	45.57	48	100000.01038.	22
36	46.54	48	46.54	48	100000.01083.	23
38	47.51	48	47.51	48	100000.01129.	23
40	48.48	48	48.48	48	100000.01175.	24
42	49.45	48	49.45	48	100000.01223.	24
44	50.42	48	50.42	48	100000.01271.	25
46	51.39	48	51.39	48	100000.01320.	25
48	52.36	48	52.36	48	100000.01371.	25
50	53.33	48	53.33	48	100000.01423.	26
52	54.30	48	54.30	48	100000.01474.	26
54	55.27	48	55.27	48	100000.01527.	27
56	56.24	48	56.24	48	100000.01581.	27
58	57.21	48	57.21	48	100000.01636.	28
60	58.18	48	58.18	48	100000.01692.	28

89. Grad. 58. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
58	99999.99548.	14	332685161.	Vt in	332685176.	5453855
56	99999.99519.	15	322288749.	secan	322288765.	5115695
54	99999.99488.	15	312522423.	tibus	312522439.	4808037
52	99999.99457.	16	303330587.		303330603.	4527322
50	99999.99424.	16	294663998.		294664015.	4270493
48	99999.99391.	17	286478886.		286478903.	4034914
46	99999.99356.	17	278736213.		278736231.	3818304
44	99999.99321.	18	271401049.		271401067.	3618681
42	99999.99285.	18	264442047.		264442066.	3434312
40	99999.99248.	19	257830995.		257831014.	3263684
38	99999.99210.	19	251542433.		251544253.	3105462
36	99999.99171.	20	245553327.		245553348.	2958474
34	99999.99131.	20	239842784.		239842805.	2821680
32	99999.99090.	21	234391811.		234391832.	2694159
30	99999.99048.	21	229183104.		229183125.	2575091
28	99999.99005.	21	224200862.		224200884.	2463746
26	99999.98962.	22	219430630.		219430653.	2359469
24	99999.98917.	22	214859158.		214859181.	2261675
22	99999.98871.	23	210474276.		210474300.	2169838
20	99999.98825.	23	206264790.		206264814.	2083483
18	99999.98777.	24	202220383.		202220408.	2002181
16	99999.98729.	24	198331528.		198331553.	1925549
14	99999.98680.	25	194589423.		194589448.	1853233
12	99999.98629.	25	190985914.		190985940.	1784915
10	99999.98578.	26	187513442.		187513469.	1720307
8	99999.98526.	26	184166987.		184165015.	1659144
6	99999.98473.	27	180934022.		180934050.	1601186
4	99995.98419.	27	177814469.		177814497.	1546213
2	99999.98364.	28	174800664.		174800693.	1494023
0	99999.98308.	28	171887319.		171887348.	1444431

O.Grad. 2.Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
2	59.15	48	59.15	48	100000.01749.	29
4	60.12	48	60.12	48	100000.01807.	29
6	61.09	48	61.09	48	100000.01866.	30
8	62.06	48	62.06	48	100000.01925.	30
10	63.03	48	63.03	48	100000.01986.	31
12	64.00	48	64.00	48	100000.02048.	31
14	64.96	48	64.96	48	100000.02110.	32
16	65.93	48	65.93	48	100000.02174.	32
18	66.90	48	66.90	48	100000.02238.	33
20	67.87	48	67.87	48	100000.02303.	33
22	68.84	48	68.84	48	100000.02370.	33
24	69.81	48	69.81	48	100000.02437.	34
26	70.78	48	70.78	48	100000.02505.	34
28	71.75	48	71.75	48	100000.02574.	35
30	72.72	48	72.72	48	100000.02644.	36
32	73.69	48	73.69	48	100000.02715.	36
34	74.66	48	74.66	48	100000.02787.	36
36	75.63	48	75.63	48	100000.02860.	37
38	76.60	48	76.60	48	100000.02934.	37
40	77.57	48	77.57	48	100000.03008.	38
42	78.54	48	78.54	48	100000.03084.	38
44	79.51	48	79.51	48	100000.03161.	39
46	80.48	48	80.48	48	100000.03238.	39
48	81.45	48	81.45	48	100000.03317.	40
50	82.42	48	82.42	48	100000.03396.	40
52	83.39	48	83.39	48	100000.03477.	41
54	84.36	48	84.36	48	100000.03558.	41
56	85.33	48	85.33	48	100000.03640.	41
58	86.30	48	86.30	48	100000.03724.	42
60	87.27	48	87.27	48	100000.03808.	42

89.Grad.57.Prim.

Secunda	Sinus	1''	Tangens	1''	Secans	1'
58	99999.98251.	29	169069494.	Vt in	169069523.	1397269
56	99999.98193.	29	166342566.	secan	166342596.	1352379
54	99999.98134.	29	163702207.	tibus	163702237.	1309618
52	99999.98075.	30	161144359.		161144390.	1268853
50	99999.98014.	30	158665215.		158665246.	1229963
48	99999.97952.	31	156261196.		156261228.	1192834
46	99999.97890.	31	153928938.		153928971.	1157361
44	99999.97826.	32	151665277.		151665310.	1123446
42	99999.97762.	32	149467229.		149467262.	1091002
40	99999.97697.	33	147331982.		147332016.	1059942
38	99999.97630.	33	145256883.		145256917.	1030191
36	99999.97563.	34	143239426.		143239460.	1001674
34	99999.97495.	34	141277241.		141277276.	974326
32	99999.97426.	35	139368088.		139368124.	948082
30	99999.97356.	35	137509847.		137509883.	922885
28	99999.97285.	36	135700506.		135700543.	898679
26	99999.97213.	36	133938161.		133938198.	875413
24	99999.97140.	37	132221004.		132221042.	853039
22	99999.97066.	37	130547320.		130547358.	831512
20	99999.96991.	37	128915478.		128915517.	810789
18	99999.96916.	38	127323928.		127323968.	790832
16	99999.96839.	38	125771197.		125771237.	771603
14	99999.96762.	39	124255881.		124255921.	753066
12	99999.96683.	39	122776643.		122776684.	735190
10	99999.96604.	40	121332211.		121332253.	717942
8	99999.96523.	41	119921371.		119921413.	701295
6	99999.96442.	41	118542964.		118543006.	685220
4	99999.96360.	41	117195884.		117195927.	669691
2	99999.96276.	42	115879076.		115879119.	654684
0	99999.96192.	42	114591530.		114591574.	640176

B

O. Grad. 3. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	10″
2	88.24	48	88.24	48	100000.03893.	43
4	89.21	48	89.21	48	100000.03979.	43
6	90.18	48	90.18	48	100000.04066.	44
8	91.14	48	91.14	48	100000.04154.	44
10	92.11	48	92.11	48	100000.04243.	45
12	93.08	48	93.08	48	100000.04332.	45
14	94.05	48	94.05	48	100000.04423.	46
16	95.02	48	95.02	48	100000.04515.	46
18	95.99	48	95.99	48	100000.04607.	47
20	96.96	48	96.96	48	100000.04701.	47
22	97.93	48	97.93	48	100000.04795.	48
24	98.90	48	98.90	48	100000.04891.	48
26	99.87	48	99.87	48	100000.04987.	49
28	100.84	48	100.84	48	100000.05084.	49
30	101.81	48	101.81	48	100000.05183.	49
32	102.78	48	102.78	48	100000.05282.	50
34	103.75	48	103.75	48	100000.05382.	50
36	104.72	48	104.72	48	100000.05483.	51
38	105.69	48	105.69	48	100000.05585.	51
40	106.66	48	106.66	48	100000.05688.	52
42	107.63	48	107.63	48	100000.05792.	52
44	108.60	48	108.60	48	100000.05897.	53
46	109.57	48	109.57	48	100000.06003.	53
48	110.54	48	110.54	48	100000.06109.	54
50	111.51	48	111.51	48	100000.06217.	54
52	112.48	48	112.48	48	100000.06325.	55
54	113.45	48	113.45	48	100000.06435.	55
56	114.42	48	114.42	48	100000.06545.	56
58	115.39	48	115.39	48	100000.06657.	56
60	116.36	48	116.36	48	100000.06769.	57

89.Grad.56.Prim.

Secunda	Sinus	1"	Tangens	1"	Secans	1"
58	99999.96107.	43	113332282.	Vt in	113332326.	626145
56	99999.96021.	43	112100409.	secan	112100453.	612571
54	99999.95934.	44	110895027.	tibus	110896072.	599433
52	99999.95846.	44	109715292.		109715338.	586713
50	99999.95757.	45	108560394.		108560440.	574394
48	99999.95668.	45	107429556.		107429602.	562458
46	99999.95577.	45	106322034.		106322081.	550891
44	99999.95485.	46	105237114.		105237162.	539678
42	99999.95392.	46	104174113.		104174161.	528802
40	99999.95299.	47	103132371.		103132419.	518253
38	99999.95204.	47	102111258.		102111307.	508016
36	99999.95109.	48	101110167.		101110216.	498079
34	99999.95013.	48	100128513.		100128563.	488432
32	99999.94916.	49	99165739.		99165789.	479062
30	99999.94817.	49	98221302.		95221353.	469959
28	99999.94718.	[illegible]	97294686.		97294737.	461112
26	99999.94618.	[illegible]	96385389.		96385441.	452514
24	99999.94517.	51	95492931.		95492983.	444153
22	99999.94415.	51	94616848.		94616901.	436022
20	99999.94312.	52	93756695.		93756748.	428113
18	99999.94268.	52	92912039.		92912093.	420417
16	99999.94103.	53	92082467.		92082521.	412926
14	99999.93997.	53	91267577.		91267632.	405634
12	99999.93891.	53	90466983.		90467039.	398533
10	99999.93783.	54	89680313.		89680369.	391617
8	99999.93674.	54	88907207.		88907263.	384880
6	99999.93565.	55	88147315.		88147372.	378315
4	99999.93454.	55	87400303.		87400361.	371916
2	99999.93343.	56	86665847.		86665904.	365679
0	99999.92231.	56	85963630.		85943689.	359597

O. Grad. 4. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
2	117.32	48	117.32	48	100000.06883.	57
4	118.29	48	118.29	48	100000.06997.	57
6	119.26	48	119.26	48	100000.07112.	58
8	120.23	48	120.23	48	100000.07228.	58
10	121.20	48	121.20	48	100000.07345.	59
12	122.17	48	122.17	48	100000.07463.	59
14	123.14	48	123.14	48	100000.07582.	60
16	124.11	48	124.11	48	100000.07702.	60
18	125.08	48	125.08	48	100000.07823.	61
20	126.05	48	126.05	48	100000.07944.	61
22	127.02	48	127.02	48	100000.08067.	62
24	127.99	48	127.99	48	100000.08191.	62
26	128.96	48	128.96	48	100000.08315.	63
28	129.93	48	129.93	48	100000.08441.	63
30	130.90	48	130.90	48	100000.08567.	64
32	131.87	48	131.87	48	100000.08695.	64
34	132.84	48	132.84	48	100000.08823.	65
36	133.81	48	133.81	48	100000.08952.	65
38	134.78	48	134.78	48	100000.09083.	65
40	135.75	48	135.75	48	100000.09214.	66
42	136.72	48	136.72	48	100000.09346.	66
44	137.69	48	137.69	48	100000.09479.	67
46	138.66	48	138.66	48	100000.09613.	67
48	139.63	48	139.63	48	100000.09748.	68
50	140.60	48	140.60	48	100000.09884.	68
52	141.57	48	141.57	48	100000.10020.	69
54	142.54	48	142.54	48	100000.10158.	69
56	143.50	48	143.50	48	100000.10297.	70
58	144.47	48	144.47	48	100000.10436.	70
60	145.44	48	145.44	48	100000.10576.	71

89.Grad.55.Prim.

Secunda	Sinus	f'	Tangens	f''	Secans	f''
58	99999.93117.	57	85233352.	f's in secantibus	85233411.	353665
56	99999.93003.	57	84534717.		84534776.	347880
54	99999.92888.	58	82847442.		83847502.	342225
52	99999.92772.	58	83171223.		83171313.	336726
50	99999.92655.	59	82505882.		82505943.	321349
48	99999.92537.	59	81851073.		81851134.	326100
46	99999.92418.	60	81206576.		81206637.	320975
44	99999.92298.	60	80572149.		80572211.	315969
42	99999.92177.	61	79947558.		79947620.	311080
40	99999.92055.	61	79332576.		79332639.	306303
38	99999.91933.	61	78726983.		78727046.	301636
36	99999.91809.	62	78130566.		78130630.	297074
34	99999.91685.	62	77543117.		77543182.	292616
32	99999.91559.	63	76964437.		76964502.	288256
30	99999.91453.	63	76394329.		76394394.	283994
28	99999.91305.	64	75832605.		75832671.	279825
26	99999.91177.	64	75279082.		75279149.	275748
24	99999.91048.	65	74733581.		74733648.	271759
22	99999.90917.	65	74195929.		74195996.	267855
20	99999.90786.	66	73665957.		73666025.	264036
18	99999.90654.	66	73143503.		73143571.	260297
16	99999.90521.	67	72628407.		72628476.	256638
14	99999.90387.	67	72120515.		72120585.	253055
12	99999.90252.	68	71619678.		71619748.	249546
10	99999.90116.	68	71125748.		71125819.	246110
8	99999.89980.	69	70638585.		70638656.	242744
6	99999.89842.	69	70158050.		70158121.	239447
4	99999.89703.	69	69684008.		69684080.	236218
2	99999.89564.	70	69216330.		69216402.	233052
0	99999.89423.	70	68754887.		68754960.	229950

O. Grad. 5. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
2	146.41	48	146.41	48	100000.10718.	71
4	147.38	48	147.38	48	100000.10861.	72
6	148.35	48	148.35	48	100000.11004.	72
8	149.32	48	149.32	48	100000.11149.	72
10	150.29	48	150.29	48	100000.11294.	73
12	151.26	48	151.26	48	100000.11440.	73
14	152.23	48	152.23	48	100000.11587.	74
16	153.29	48	153.29	48	100000.11735.	74
18	154.17	48	154.17	48	100000.11884.	75
20	155.14	48	155.14	48	100000.12034.	75
22	156.11	48	156.11	48	100000.12185.	76
24	157.08	48	157.08	48	100000.12337.	76
26	158.05	48	158.05	48	100000.12490.	77
28	159.02	48	159.02	48	100000.12643.	77
30	159.99	48	159.99	48	100000.12798.	78
32	160.96	48	160.96	48	100000.12954.	78
34	161.93	48	161.93	48	100000.13110.	79
36	162.90	48	162.90	48	100000.13268.	79
38	163.87	48	163.87	48	100000.13426.	79
40	164.84	48	164.84	48	100000.13586.	80
42	165.81	48	165.81	48	100000.13746.	80
44	166.78	48	166.78	48	100000.13907.	81
46	167.75	48	167.75	48	100000.14069.	81
48	168.72	48	168.72	48	100000.14232.	82
50	169.68	48	169.68	48	100000.14396.	82
52	170.65	48	170.65	48	100000.14561.	83
54	171.62	48	171.62	48	100000.14727.	83
56	172.59	48	172.59	48	100000.14894.	84
58	173.56	48	173.56	48	100000.15062.	84
60	174.53	48	174.53	48	100000.15231.	85

89.Grad 54.Prim.

Secunda	Sinus	1′	Tangens	1″	Secans	1″
58	99999.89282.	71	68299556.	Vt in	68299629.	226909
56	99999.89139.	71	67850216.	secan	67850290.	223929
54	99999.88996.	72	67406750.	tibus	67406824.	221006
52	99999.88851.	72	66969043.		66969043.	218140
50	99999.88706.	73	66536984.		66536984.	215331
48	99999.88560.	73	66110464.		66110464.	212573
46	99999.88413.	74	65689378.		65689454.	209870
44	99999.88265.	74	65273622.		65273698.	207218
42	99999.88116.	75	64863095.		64863172.	204615
40	99999.87966.	75	64457700.		64457778.	202062
38	99999.87815.	76	64057341.		64057419.	199556
36	99999.87663.	76	63661925.		63662003.	197096
34	99999.87510.	76	63271360.		63271439.	194681
32	99999.87356.	77	62885559.		62885638.	192310
30	99999.87202.	77	62504433.		62504513.	189983
28	99999.87046.	78	62127900.		62127980.	187698
26	99999.86890.	78	61755876.		61755957.	185453
24	99999.86732.	79	61388281.		61388362.	183249
22	99999.86574.	79	61025036.		61025118.	181083
20	99999.86414.	80	60666065.		60666147.	178956
18	99999.86254.	80	60311292.		60311374.	176866
16	99999.86093.	81	59960643.		59960727.	174812
14	99999.85931.	81	59614050.		59614134.	172794
12	99999.85768.	82	59271440.		59271524.	170811
10	99999.85604.	82	58932745.		58932830.	168862
8	99999.85439.	83	58597899.		58597985.	166945
6	99999.85273.	83	58266837.		58266923.	165062
4	99999.85106.	84	57939495.		57939581.	163210
2	99999.84938.	84	57615810.		57615897.	161389
0	99999.84769.	54	57295721.		57295809.	159598

O.Grad.6.Prim.

Secunda	Sinus	1''	Tangens	1''	Secans	1''
2	175.50	48	175.50	48	100000.15401.	85
4	176.47	48	176.47	48	100000.15571.	86
6	177.44	48	177.44	48	100000.15743.	86
8	178.41	48	178.41	48	100000.15915.	87
10	179.38	48	179.38	48	100000.16089.	87
12	180.35	48	180.35	48	100000.16263.	88
14	181.32	48	181.32	48	100000.16438.	88
16	182.29	48	182.29	48	100000.16615.	88
18	183.26	48	183.26	48	100000.16792.	89
20	184.23	48	184.23	48	100000.16970.	89
22	185.20	48	185.20	48	100000.17149.	90
24	186.17	48	186.17	48	100000.17329.	90
26	187.14	48	187.24	48	100000.17510.	91
28	188.11	48	188.11	48	100000.17692.	91
30	189.08	48	189.08	48	100000.17875.	92
32	190.05	48	190.05	48	100000.18059.	92
34	191.02	48	191.02	48	100000.18244.	93
36	191.99	48	191.99	48	100000.18430.	93
38	192.96	48	192.96	48	100000.18616.	94
40	193.93	48	193.95	48	100000.18804.	94
42	194.89	48	194.90	48	100000.18992.	95
44	195.86	48	195.86	48	100000.19181.	95
46	196.83	48	196.83	48	100000.19372.	96
48	197.80	48	197.80	48	100000.19593.	96
50	198.77	48	198.77	48	100000.19756.	96
52	199.74	48	199.74	48	100000.19949.	97
54	200.71	48	200.71	48	100000.20143.	97
56	201.68	48	201.68	48	100000.20338.	98
58	202.65	48	202.65	48	100000.20534.	98
60	203.62	48	203.62	48	100000.20731.	99

89.Grad.53.prim.

Secunda	Sinus	1"	Tangens	1"	Secans	1"
58	99999.84599.	85	56979170.	Vt in	56979257.	157837
56	99999.84429.	85	56666097.	secan-	56666185.	156104
54	99999.84257.	86	56356445.	tibus	56356534.	154401
52	99999.84085.	86	56050160.		56050249.	152725
50	99999.83911.	87	55747185.		55747275.	151076
48	99999.83737.	87	55447468.		55447558.	149455
46	99999.83562.	88	55150957.		55151048.	147857
44	99999.83385.	88	54857600.		54857692.	146287
42	99999.83208.	89	54567348.		54567440.	144741
40	99999.83030.	89	54280151.		54280243.	143220
38	99999.82851.	90	53995961.		53996053.	141722
36	99999.82671.	90	53714731.		53714824.	140247
34	99999.82490.	91	53436416.		53436509.	138796
32	99999.82308.	91	53160970.		53161064.	137366
30	99999.82125.	92	52888349.		52888443.	135960
28	99999.81941.	92	52618510.		52618604.	134573
26	99999.81756.	92	52351410.		52351505.	133210
24	99999.81571.	93	52087008.		52087104.	131866
22	99999.81384.	93	51825264.		51825360.	130542
20	99999.81196.	94	51566137.		51566234.	129238
18	99999.81008.	94	51309588.		51309686.	127956
16	99999.80819.	95	51055580.		51055678.	126689
14	99999.80628.	95	50804074.		50804172.	125442
12	99999.80437.	96	50555034.		50555133.	124213
10	99999.80245.	96	50308423.		50308522.	123004
8	99999.80051.	97	50064207.		50064307.	121810
6	99999.79857.	97	49822350.		49822450.	120636
4	99999.79662.	98	49582819.		49582920.	119477
2	99999.79466.	98	49345580.		49345681.	118336
0	99999.79269.	99	49110900.		46110702.	117209

C

O. Grad. 7. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
2	204.59	48	204.59	48	100000.20929.	99
4	205.56	48	205.56	48	100000.21128.	100
6	206.53	48	206.53	48	100000.21327.	100
8	207.50	48	207.50	48	100000.21528.	101
10	208.47	48	208.47	48	100000.21730.	101
12	209.44	48	209.44	48	100000.21932.	102
14	210.41	48	210.41	48	100000.22136.	102
16	211.37	48	211.38	48	100000.22340.	103
18	212.35	48	212.35	48	100000.22546.	103
20	213.32	48	213.32	48	100000.22752.	104
22	214.29	48	214.29	48	100000.22960.	104
24	215.26	48	215.26	48	100000.23168.	105
26	216.23	48	216.23	48	100000.23377.	105
28	217.20	48	217.20	48	100000.23587.	105
30	218.17	48	218.17	48	100000.23798.	106
32	219.14	48	219.14	48	100000.24010.	106
34	220.11	48	220.11	48	100000.24223.	107
36	221.07	48	221.08	48	100000.24437.	107
38	222.04	48	222.04	48	100000.24652.	108
40	223.01	48	223.01	48	100000.24868.	108
42	223.98	48	223.98	48	100000.25084.	109
44	224.95	48	224.95	48	100000.25302.	109
46	225.92	48	225.92	48	100000.25521.	110
48	226.89	48	226.89	48	100000.25741.	110
50	227.86	48	227.86	48	100000.25961.	111
52	228.83	48	228.83	48	100000.26182.	111
54	229.80	48	229.80	48	100000.26404.	112
56	230.77	48	230.77	48	100000.26628.	112
58	231.74	48	231.74	48	100000.26851.	112
60	232.71	48	232.71	48	100000.27077.	113

89.Grad.52.prim.

Secunda	Sinus	1''	Tangens	1''	Secans	1''
58	99999.79071.	99	48877848.	Vt in	48877950.	116099
56	99999.78872.	100	48647291.	secan-	48647394.	115005
54	99999.78673.	100	48418810.	tibus	48419003.	113927
52	99999.78472.	100	48192643.		.48192746.	112864
50	99999.78270.	101	47968490.		47968594.	111815
48	99999.78068.	101	47746413.		47746518.	110780
46	99999.77864.	102	47526383.		.47526488.	109761
44	99999.77660.	102	47308371.		47308477.	108755
42	99999.77454.	103	47092351.		47092457.	107763
40	99999.77248.	103	46878294.		46878400.	107685
38	99999.77040.	104	46666174.		46666281.	105818
36	99999.76832.	104	46455966.		46456073.	104867
34	99999.76623.	105	46247642.		.46247750.	103927
32	99999.76413.	105	46041179.		46041288.	103001
30	99999.76202.	106	45836551.		45836660.	102085
28	99999.75990.	106	45633734.		45633843.	101184
26	99999.75777.	107	45432703.		45432813.	100293
24	99999.75563.	107	45233436.		45233547.	99414
22	99999.75348.	108	45035910.		.45036021.	98547
20	99999.75132.	108	44840101.		44840212.	97690
18	99999.74916.	108	44645987.		44646099.	96846
16	99999.74698.	109	44453547.		.44453660.	96012
14	99999.74479.	109	44262759.		44262871.	95189
12	99999.74260.	110	44073601.		44073714.	94376
10	99999.74039	110	43886053.		.43886167.	93573
8	99999.73818.	111	43700095.		43700209.	92781
6	99999.73596.	111	43515705.		43515820.	92000
4	99999.73372.	112	43332866.		43332981.	91227
2	99999.73148.	112	43151556.		43151672.	90464
0	99999.72923.	113	42971757.		42991873.	98712

O. Grad. 8. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
2	233.68	48	233.68	48	100000.27303.	113
4	234.65	48	234.65	48	100000.27530.	114
6	235.62	48	235.62	48	100000.27758.	114
8	236.59	48	236.59	48	100000.27987.	115
10	237.56	48	237.56	48	100000.28217.	115
12	238.53	48	238.53	48	100000.28448.	116
14	239.50	48	239.50	48	100000.28680.	116
16	240.47	48	240.47	48	100000.28912.	117
18	241.44	48	241.44	48	100000.29146.	117
20	242.41	48	242.41	48	100000.29381.	118
22	243.38	48	243.38	48	100000.29616.	118
24	244.36	48	244.35	48	100000.29853.	119
26	245.32	48	245.32	48	100000.30090.	119
28	246.29	48	246.29	48	100000.30328.	120
30	247.25	48	247.26	48	100000.30568.	120
32	248.22	48	248.22	48	100000.30808.	120
34	249.19	48	249.19	48	100000.31045.	121
36	250.16	48	250.16	48	100000.31291.	121
38	251.13	48	251.13	48	100000.31534.	122
40	252.10	48	252.10	48	100000.31778.	122
42	253.07	48	253.07	48	100000.32023.	123
44	254.04	48	254.04	48	100000.32269.	123
46	255.01	48	255.01	48	100000.32516.	124
48	255.98	48	255.98	48	100000.32763.	124
50	256.95	48	256.95	48	100000.33012.	125
52	257.92	48	257.92	48	100000.33262.	125
54	258.89	48	258.89	48	100000.33512.	126
56	259.86	48	259.86	48	100000.33764.	126
58	260.83	48	260.83	46	100000.34016.	127
60	261.80	48	261.80	48	100000.34270.	127

89. Grad. 51. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
58	99999.72697.	113	42793450.	Vt in secantibus	42793567.	88967
56	99999.72470.	114	42616617.		42616734.	88234
54	99999.72242.	114	42441240.		42441357.	87508
52	99999.72013.	115	42267299.		42267418.	86791
50	99999.71783.	115	42094779.		42094898.	86083
48	99999.71552.	116	41923662.		41923781.	85385
46	99999.71310.	116	41753930.		41754049.	84693
44	99999.71088.	116	41585566.		41585686.	84011
42	99999.70854.	117	41418555.		41418676.	83337
40	99999.70619.	117	41252880.		41253001.	82671
38	99999.70384.	118	41088526.		41088647.	82013
36	99999.70147.	118	40925475.		40925598.	81364
34	99999.69910.	119	40763714.		40763837.	80729
32	99999.69672.	119	40603226.		40603349.	80085
30	99999.69432.	120	40443997.		40444121.	79457
28	99999.69192.	120	40286012.		40286136.	78838
26	99999.68951.	121	40129257.		40129381.	78225
24	99999.68709.	121	39973716.		39973841.	77619
22	99999.68466.	122	39819770.		39819503.	77020
20	99999.68222.	122	39666225.		39666452.	76428
18	99999.67977.	123	39514246.		39514373.	75842
16	99999.67731.	123	39393728.		39363555.	75265
14	99999.67484.	124	36213756.		39213884.	74693
12	99999.67237.	124	39065219.		39065347.	74128
10	99999.66988.	124	38917802.		38917931.	73568
8	99999.66738.	125	38771494.		38771623.	73016
6	99999.66488.	125	38626282.		38626411.	72470
4	99999.66236.	126	38482153.		38482283.	71929
2	99999.65984.	126	38339096.		38339227.	71394
0	99999.65731.	127	38197099.		38197230.	70867

O.Grad.9.Prim.

Secunda	Sinus	10″	Tangens	10″	Secans	10″
2	262.77	48	262.77	48	100000.34524.	127
4	263.74	48	263.74	48	100000.34779.	128
6	264.71	48	264.71	48	100000.35035.	128
8	265.68	48	265.68	48	100000.35292.	129
10	266.65	48	266.65	48	100000.35551.	129
12	267.62	48	267.62	48	100000.35816.	130
14	268.59	48	268.59	48	100000.36070.	130
16	269.56	48	269.56	48	100000.36331.	131
18	270.53	48	270.53	48	100000.36592.	131
20	271.50	48	271.50	48	100000.36855.	132
22	272.46	48	272.47	48	100000.37119.	132
24	273.43	48	273.44	48	100000.37383.	133
26	274.40	48	274.41	48	100000.37649.	133
28	275.37	48	275.37	48	100000.37915.	134
30	276.34	48	276.34	48	100000.38183.	134
32	277.31	48	277.31	48	100000.38452.	135
34	278.28	48	278.28	48	100000.38721.	135
36	279.25	48	279.25	48	100000.38991.	135
38	280.22	48	280.22	48	100000.39262.	136
40	281.19	48	281.19	48	100000.39534.	136
42	282.16	48	282.16	48	100000.39807.	137
44	283.13	48	283.13	48	100000.40081.	137
46	284.10	48	284.10	48	100000.40357.	138
48	285.07	48	285.07	48	100000.40633.	138
50	286.04	48	286.04	48	100000.40909.	139
52	287.01	48	287.01	48	100000.41188.	139
54	287.98	48	287.98	48	100000.41466.	140
5	288.95	4	288.95	48	100000.41746.	140
5	289.92	4	289.92	48	100000.42027.	141
6	290.89	48	290.89	4	100000.42308.	141

89. Grad. 50. Prim.

Secunda	Sinus	1″	Tangens	1″	Secans	1″
58	99999.65479.	127	38056150.	Vt in	38056281.	70344
56	99999.65221.	128	37916237.	secan	37916369.	69827
54	99999.64965.	128	37777349.	tibus	37777481.	69316
52	99999.64708.	129	37639475.		37639607.	68811
50	99999.64450.	129	37502603.		37502736.	68310
48	99999.64291.	130	37366724.		37366857.	67816
46	99999.63931.	130	37231825.		37231959.	67326
44	99999.63670.	131	37097897.		37098032.	66843
42	99999.63408.	131	36964929.		36965064.	66365
40	99999.63145.	131	36832911.		36833046.	65890
38	99999.62881.	132	36701832.		36701968.	65422
36	99999.62617.	132	36571683.		36571820.	64958
34	99999.62351.	133	36442454.		36442591.	64500
32	99999.62085.	133	36314135.		36314272.	64046
30	99999.61817.	134	36186716.		36186854.	63597
28	99999.61539.	134	36060188.		36060327.	63152
26	99999.61279.	135	35934542.		35934682.	62713
24	99999.61009.	135	35809769.		35809909.	62278
22	99999.60738.	136	35685859.		35685999.	61848
20	99999.60466.	136	35562804.		35562944.	61422
18	99999.60192.	137	35440594.		35440735.	60999
16	99999.59918.	137	35319222.		35319363.	60581
14	99999.59643.	138	35198678.		35198820.	60169
12	99999.59367.	138	35078954.		35079896.	59760
10	99999.59091.	139	34960041.		34960184.	59355
8	99999.58813.	139	34841932.		34842076.	58953
6	99999.58534.	139	34724619.		34724763.	58558
4	99999.58254.	140	34608093.		34608237.	58165
2	99999.57974.	140	34492346.		34492491.	57776
0	99999.57692.	141	34377371.		34377516.	5739[illegible]

0.Grad.

Prima	Secunda	Sinus	10″	Tangens	10″	Secans	10″
10	10	395.75	485	295.74	485	100000.43730.	1446
	20	300.58	485	300.59	485	100000.45176.	1469
	30	305.43	485	305.43	485	100000.46645.	1492
	40	310.28	485	310.28	485	100000.48137.	1516
	50	315.13	485	315.13	485	100000.49653.	1540
11	0	319.98	485	319.98	485	100000.51193.	1563
	10	324.82	485	324.83	485	100000.52756.	1586
	20	329.67	485	329.67	485	100000.54342.	1610
	30	334.52	485	334.52	485	100000.55952.	1634
	40	339.37	485	339.37	485	100000.57586.	1657
	50	344.22	485	344.22	485	100000.59243.	1681
12	0	349.06	485	349.07	485	100000.60924.	1704
	10	353.91	485	353.92	485	100000.62628.	1727
	20	358.76	485	358.76	485	100000.64355.	1751
	30	363.61	485	363.61	485	100000.66106.	1775
	40	368.46	485	368.46	485	100000.67881.	1798
	50	373.31	485	373.31	485	100000.69679.	1822
13	0	378.15	485	378.16	485	100000.71501.	1845
	10	383.00	485	383.00	485	100000.73346.	1869
	20	387.85	485	387.85	485	100000.75215.	1892
	30	392.70	485	392.70	485	100000.77107.	1915
	40	397.55	485	397.55	485	100000.79022.	1939
	50	402.39	485	402.40	485	100000.80961.	1963
14	0	407.24	485	407.25	485	100000.82924.	1986
	10	412.09	485	412.09	485	100000.84910.	2010
	20	416.94	485	416.94	485	100000.86920.	2033
	30	421.79	485	421.79	485	100000.88953.	2057
	40	426.63	485	426.64	485	100000.91010.	2089
	50	431.48	485	431.49	485	100000.93090.	2104
15	0	436.33	485	436.33	485	100000.95194.	2127

89.Grad.

Prima	Secunda	Sinus	10"	Tangens	1"	Secans	1"	Iec.
	50	99999.56270.	1422	33813804.	Vt in	33813952.	55523	187
	40	99999.54824.	1446	33268417.	secan	33268567.	53745	174
	30	99999.53355.	1469	32740344.	tibus	32740496.	52051	169
	20	99999.51863.	1492	32228773.		32228928.	50437	161
	10	99999.50347.	1516	31732942.		31733100.	48895	154
49	0	99999.48807.	1540	31252137.		31252297.	47423	147
	50	99999.47244.	1563	30785684.		30785846.	46017	140
	40	99999.45658.	1586	30332950.		30333115.	44673	134
	30	99999.44048.	1610	29893339.		29893506.	43387	128
	20	99999.42414.	1634	29466288.		29466457.	42155	123
	10	99999.40757.	1657	29051266.		29051438.	40975	118
48	0	99999.39076.	1681	28647773.		28647948.	39844	113
	50	99999.37372.	1704	28255335.		28255512.	38759	109
	40	99999.35645.	1727	27873503.		27873682.	37718	104
	30	99999.33894.	1751	27501853.		27502035.	36718	100
	20	99999.32119.	1775	27139983.		27140167.	35758	96
	10	99999.30321.	1798	26787513.		26787699.	34835	92
47	0	99999.28499.	1822	26444080.		26444269.	33946	89
	50	99999.26654.	1845	26109341.		26199533.	33092	85
	40	99999.24786.	1868	25782971.		25783165.	32269	82
	30	99999.22894.	1892	25464660.		25464856.	31477	79
	20	99999.20978.	1916	25154112.		25154311.	30713	76
	10	99999.19039.	1939	24851047.		24851246.	29977	73
46	0	99999.17076.	1963	24555198.		24555402.	29267	71
	50	99999.15090.	1986	24266310.		24266516.	28582	68
	40	99999.13081.	2009	23984141.		23984349.	27921	66
	30	99999.11048.	2033	23708458.		23708669.	27282	64
	20	99999.08991.	2057	23439040.		23439254.	26666	61
	10	99999.06911.	2080	23175677.		23175893.	26069	60
	0	99999.04807.	2104	22918166.		22918384.	25493	57

D

O. Grad.

Prima	Secunda	Sinus	10″	Tangens	10″	Secans	10″
15	10	441.18	485	441.18	485	100000.97321.	2150
	20	446.03	485	446.03	485	100000.99471.	2175
	30	450.87	485	450.88	485	100001.01646.	2191
	40	455.72	485	455.73	485	10000.103843.	2222
	50	460.57	485	460.58	485	10000.106065.	2244
16	0	465.42	485	465.42	485	10000.108309.	2269
	10	470.27	485	470.27	485	10000.110578.	2291
	20	475.12	485	475.12	485	10000.312869.	2315
	30	479.96	485	479.97	485	10000.115184.	2339
	40	484.81	485	484.82	485	10000.117523.	2362
	50	489.66	485	489.67	485	10000.119885.	2386
17	0	494.51	485	494.51	485	10000.122271.	2409
	10	499.36	485	499.36	485	10000.124680.	2433
	20	504.20	485	504.21	485	10000.127113.	2456
	30	509.05	485	509.06	485	10000.129569.	2480
	40	513.99	485	513.91	485	10000.132049.	2504
	50	518.75	485	518.76	485	10000.134553.	2526
18	0	523.60	485	523.60	485	10000.137079.	2551
	10	528.44	485	528.45	485	10000.139630.	2573
	20	533.29	485	533.30	485	10000.142203.	2598
	30	538.14	485	538.15	485	10000.144801.	262[illegible]
	40	542.99	485	543.00	485	10000.147421.	2645
	50	547.84	485	547.84	485	10000.150066.	2668
19	0	552.68	485	552.69	485	10000.152734.	2691
	10	557.53	485	557.54	485	10000.155425.	2715
	20	562.38	485	562.39	485	10000.158140.	2738
	30	567.23	485	567.24	485	10000.160878.	2761
	40	572.08	485	572.09	485	10000.163640.	2785
	50	576.92	485	576.93	485	10000.166425.	[illegible]
20	0	581.77	485	581.78	485	10000.169234.	[illegible]

89.Grad.

Prima	Secunda	Sinus	10″	Tangens	1″	Secans	1″	Inc.
	50	99999.02680.	2127	22666315.	Vt in	22666536.	24935	56
	40	99999.00529.	2151	22419939.	secan	22420162.	24190	54
	30	99998.99355.	2174	22178861.	tibus	22179086.	23873	52
	20	99998.96158.	1197	21942912.		21943140.	23368	50
	10	99998.93936.	2222	21711931.		21712162.	22879	49
44	0	99998.91692.	2244	21485762.		21485995.	22404	47
	50	99998.89424.	2268	21264256.		21264491.	21944	46
	40	99998.87132.	2292	21047271.		21047508.	21499	44
	30	99998.84817.	2315	20834669.		20834909.	21066	43
	20	99998.82478.	2339	20626319.		20626561.	20647	42
	10	99998.80116.	2362	20422095.		20422340.	20240	41
43	0	99998.77130.	2386	20221875.		20222122.	19845	39
	50	99998.75321.	2409	20025543.		20025792.	19461	38
	40	99998.72888.	2433	19832986.		19833238.	19089	37
	30	99998.70432.	2456	19644097.		19644352.	18727	36
	20	99998.67952.	2480	19458773.		19459030.	18375	35
	10	99998.65449.	2503	19276912.		19277171.	18033	34
42	0	99998.62922.	2527	19098419.		19090680.	17700	33
	50	99998.60372.	2550	18923200.		18923465.	17377	32
	40	99998.57798.	2574	18751168.		18751435.	18062	31
	30	99998.55201.	2597	18582235.		18582505.	16756	30
	20	99998.52580.	2621	18416319.		18416591.	16458	30
	10	99998.49936.	2644	18253340.		18253614.	16168	29
41	0	99998.47268.	2668	18093220.		18093496.	15885	28
	50	99998.44577.	2691	17935884.		17936163.	15610	27
	40	99998.41862.	2715	17781261.		17781542.	15342	27
	30	99998.39124.	2738	17629281.		17629565.	15080	26
	20	99998.36363.	2761	17479878.		17480164.	14826	25
	10	99998.33577.	2786	17332985.		17333273.	14578	25
40	0	99998.30768.	2809	17188540.		17188831.	14336	24

O.Grad.

Prima	Secunda	Sinus	1''	Tangens	1''	Secans	10''
20	10	586.62	485	586.63	485	100001.7207.	285
	20	591.47	485	591.48	485	100001.7492.	288
	30	596.32	485	596.33	485	100001.7780.	290
	40	661.16	485	601.18	485	100001.8070.	293
	50	606.01	485	606.02	485	100001.8363.	295
21	0	610.86	485	610.87	485	100001.8658.	297
	10	615.71	485	615.72	485	100001.8955.	300
	20	620.56	485	620.57	485	100001.9255.	302
	30	625.41	485	625.42	485	100001.9557.	305
	40	630.25	485	630.27	485	100001.9862.	306
	50	635.10	485	635.11	485	100002.0168.	309
22	0	639.95	485	639.96	485	100002.0477.	312
	10	644.80	485	644.81	485	100002.0789.	314
	20	649.65	485	649.66	485	100002.1103.	316
	30	654.49	485	654.51	485	100002.1419.	318
	40	659.34	485	659.36	485	100002.1737.	321
	50	664.19	485	664.20	485	100902.2058.	323
23	0	669.04	485	669.05	485	100002.2381.	326
	10	673.89	485	673.90	485	100002.2707.	328
	20	678.73	485	678.75	485	100002.3035.	330
	30	683.58	485	683.50	485	100002.3365.	333
	40	688.43	485	688.45	485	100002.3698.	335
	50	693.28	485	693.29	485	100002.4033.	337
24	0	608.13	485	698.14	485	100002.4370.	339
	10	702.97	485	702.99	485	100002.4709.	342
	20	707.82	485	707.84	485	100002.5051.	345
	30	712.67	485	712.69	485	100002.5396.	347
	40	717.52	485	717.54	485	100002.5743.	349
	50	722.37	485	722.38	485	100002.6092.	351
25	0	727.21	485	727.23	485	100002.6443.	354

89.Grad.

Prima	Secunda	Sinus	10"	Tangens	1"	Secans	1"	Ire
	50	99998.2794.	283	17046483.	Vt in secantibus	17046776.	14100	23
	40	99998.2508.	286	16906754.		16907050.	13869	23
	30	99998.2220.	288	16769290.		16769596.	13645	22
	20	99998.1930.	290	16634058.		16634359.	13425	22
	10	99998.1637.	293	16500982.		16501285.	13211	21
39	0	99998.1342.	295	16370019.		16370324.	13003	21
	50	99998.1045.	297	16241118.		16241426.	12798	20
	40	99998.0745.	300	16114231.		16114541.	12699	19
	30	99998.0443.	302	15989311.		15989624.	12404	19
	20	99998.0139.	304	15866313.		15866629.	12214	18
	10	99997.9832.	307	15745193.		15745511.	12028	18
38	0	99997.9523.	309	15625908.		15626228.	11847	18
	50	99997.9212.	311	15508407.		15508739.	11669	18
	40	99997.8898.	314	15392679.		15393004.	11496	17
	30	99997.8582.	316	15278656.		15278984.	11326	17
	20	99997.8263.	319	15166310.		15166640.	11160	16
	10	99997.7942.	321	15055604.		15055936.	10997	16
37	0	99997.7619.	323	14946502.		14946836.	10839	16
	50	99997.7294.	325	14838970.		14831307.	10683	15
	40	99997.6966.	328	14732974.		14733313.	10531	15
	30	99997.6635.	330	14628482.		14628823.	10382	15
	20	99997.6303.	332	14525461.		14525805.	10236	14
	10	99997.5968.	335	14423881.		14424228.	10094	14
36	0	99997.5631.	337	14323712.		14324061.	9954	14
	50	99997.5291.	340	14224925.		14225276.	9817	14
	40	99997.4949.	342	14127490.		14127844.	9683	13
	30	99997.4605.	344	14031382.		14031738.	9552	13
	20	99997.4258.	347	13936572.		13936931.	9423	13
	10	99997.3909.	349	13843035.		13843396.	9297	12
35	0	99997.3558.	351	13750745.		13751108.	9173	12

O.Grad.

Prima	Secunda	Sinus	10″	Tangens	10″	Secans	10″
25	10	732.06	485	732.08	485	100002.6797.	356
	20	736.91	485	736.93	485	100002.7153.	358
	30	741.76	485	741.78	485	100002.7511.	361
	40	746.61	485	746.63	485	100002.7872.	363
	50	751.45	485	751.48	485	100002.8235.	366
26	0	756.30	485	756.32	485	100002.8601.	368
	10	761.15	485	761.17	485	100002.8969.	370
	20	766.00	485	766.02	485	100002.9339.	372
	30	770.85	485	770.87	485	100002.9711.	375
	40	775.69	485	775.72	485	100003.0086.	378
	50	780.54	485	780.57	485	100003.0464.	379
27	0	785.39	485	785.41	485	100003.0843.	382
	10	790.24	485	790.26	485	100003.1225.	385
	20	795.09	485	795.11	485	100003.1610.	387
	30	799.93	485	799.96	485	100003.1996.	389
	40	804.78	485	804.81	485	100003.2385.	391
	50	809.63	485	809.66	485	100003.2777.	393
28	0	814.48	485	814.50	485	100003.3170.	396
	10	819.33	485	819.35	485	100003.3566.	399
	20	824.17	485	824.20	485	100003.3965.	401
	30	829.02	485	829.05	485	100003.4366.	403
	40	833.87	485	833.90	485	100003.4769.	405
	50	838.72	485	838.75	485	100003.5174.	408
29	0	843.57	485	843.60	485	100003.5582.	410
	10	848.41	485	848.44	486	100003.5992.	413
	20	853.26	485	853.29	485	100003.6405.	415
	30	858.11	485	858.14	485	100003.6820.	417
	40	862.96	485	862.99	485	100003.7237.	419
	50	867.81	485	867.84	485	100003.7656.	422
30	0	872.65	485	872.69	485	100003.8078.	424

89.Grad.

Prima	Secunda	Sinus	10″	Tangens	1″	Secans	1″	Inc.
	50	99997.3204.	354	13659677.	Vt in secan tibus	13660043.	9052	12
	40	99997.2848.	356	13569807.		13570176.	8933	12
	30	99997.2489.	355	13481113.		13481483.	8817	11
	20	99997.2129.	360	13393570.		13393943.	8703	11
	10	99997.1765.	364	13307156.		13307532.	8591	11
	0	99997.1400.	365	13221851.		13222229.	8481	11
34	50	99997.1032.	368	13137632.		13138013.	8373	11
	40	99997.0662.	370	13054479.		13054862.	8268	10
	30	99997.0289.	373	12972372.		12972958.	8164	10
	20	99996.9914.	375	12891292.		12891680.	8062	10
	10	99996.9537.	377	12811218.		12811609.	7962	10
	0	99996.9158.	379	12732134.		12732526.	7864	10
33	50	99996.8776.	382	12654019.		12654414.	7768	9
	40	99996.8391.	385	12576857.		12577255.	7674	9
	30	99996.8005.	386	12500631.		12501031.	7581	9
	20	99996.7616.	389	12425322.		12425725.	7490	9
	10	99996.7224.	392	12350916.		12351321.	7400	9
	0	99996.6831.	393	12277395.		12278073.	7312	9
32	40	99996.6435.	396	12204745.		12205153.	7226	8
	40	99996.6036.	399	12132949.		12133361.	7141	8
	30	99996.5635.	401	12061993.		12062407.	7058	8
	20	99996.5232.	403	11991862.		11992279.	6976	8
	10	99996.4827.	405	11922541.		11922961.	6896	8
	0	99996.4419.	408	11854018.		11854440.	6817	8
31	50	99996.4009.	410	11786277.		11786702.	6739	8
	40	99996.3596.	413	11719307.		11719733.	6662	8
	30	99996.3182.	414	11653093.		11653522.	6587	7
	20	99996.2764.	418	11587622.		11588054.	6514	7
	10	99996.2345.	419	11522884.		11523318.	6441	7
30	0	99996.1923.	422	11458865.		11459301.	6370	7

O.Grad.

Prima	Secunda	Sinus	1''	Tangens	1''	Secans	10''
30	10	877.50	485	877.54	485	100003.8503.	427
	20	882.35	485	882.38	485	100003.8929.	429
	30	887.20	485	887.23	485	100003.9358.	431
	40	892.05	485	892.08	485	100003.9790.	434
	50	896.89	485	896.93	485	100004.0223.	436
31	0	901.74	485	901.78	485	100004.0659.	438
	10	906.59	485	906.63	485	100004.1098.	441
	20	911.44	485	911.47	485	100004.1538.	443
	30	916.28	485	916.32	485	100004.1981.	445
	40	921.13	485	921.17	485	100004.2427.	448
	50	925.98	485	926.02	485	100004.2875.	450
32	0	930.83	485	930.87	485	100004.3325.	452
	10	935.68	485	935.72	485	100004.3777.	455
	20	940.52	485	940.57	485	100004.4232.	457
	30	945.37	485	945.41	485	100004.4689.	459
	40	950.22	485	950.26	485	100004.5149.	462
	50	955.07	485	955.11	485	100004.5611.	464
33	0	959.92	485	959.96	485	100004.6075.	467
	10	964.70	485	964.81	485	100004.6542.	469
	20	969.61	485	969.66	485	100004.7011.	471
	30	974.46	485	974.51	485	100004.7482.	474
	40	979.31	485	979.35	485	100004.7956.	476
	50	984.16	485	984.20	485	100004.8432.	478
34	0	989.00	485	989.05	485	100004.8910.	481
	10	993.85	485	993.90	484	100004.8391.	483
	20	998.70	485	998.75	484	100004.9874.	485
	30	1003.55	485	1093.60	484	100005.0359.	488
	40	1008.40	485	1008.45	484	100005.0847.	490
	50	1013.24	485	1013.30	484	100005.1337.	492
35	0	1018.09	485	1018.14	484	100005.1829.	495

89. Grad.

Prima	Secunda	Sinus	1″	Tangens	1″	Secans	1″	Inc.
	50	99996.1499.	424	11395553.	Vt in secantibus	11395992.	6299	7
	40	99996.1072.	427	11332937.		11333378.	6230	7
	30	99996.0643.	429	11271005.		11271449.	6162	7
	20	99996.0212.	431	11209746.		11210192.	6095	6
	10	99995.9778.	434	11149150.		11149598.	6030	6
29	0	99995.9342.	436	11089205.		11089656.	5965	6
	50	99995.8904.	438	11029901.		11030355.	5901	6
	40	99995.8463.	441	10971228.		10971684.	5839	6
	30	99995.8020.	443	10913176.		10913634.	5777	6
	20	99995.7575.	445	10855735.		10856196.	5717	6
	10	99995.7127.	448	10798896.		10799359.	5657	6
28	0	99995.6677.	450	10742648.		10743114.	5598	6
	50	99995.6224.	452	10686984.		10687452.	5540	6
	40	99995.5670.	455	10631893.		10632363.	5483	6
	30	99995.5312.	457	10577367.		10577840.	5427	5
	20	99995.4853.	459	105[illegible]398.		10523873.	5372	5
	10	99995.4391.	462	10469976.		10470454.	5317	5
27	0	99995.3927.	464	10417094.		10417574.	5264	5
	50	99995.3460.	467	10364744.		10365226.	5211	5
	40	99995.2991.	469	10312917.		10313402.	5159	5
	30	99995.2520.	471	10261606.		10262093.	5108	5
	20	99995.2047.	474	10210802.		10211292.	5057	5
	10	99995.1571.	476	10160500.		10160992.	5008	5
26	0	99995.1092.	478	10110690.		10111185.	4959	5
	50	99995.0612.	481	10061366.		10061863.	4910	5
	40	99995.0129.	483	10012522.		10013021.	4865	5
	30	99994.9643.	485	9964149.		9964651.	4816	5
	20	99994.9156.	488	9916241.		9916745.	4770	4
	10	99994.8666.	490	9868792.		9869298.	4724	4
25	0	99994.8173.	492	9821794.		9822303.	4679	4

O.Grad.

Prima	Secunda	Sinus	10″	Tangens	10″	Secans	10″
35	10	1022.94	485	1022.99	485	100005.2324.	497
	20	1027.79	485	1027.84	485	100005.2821.	499
	30	1032.63	485	1032.69	485	100005.3321.	502
	40	1037.48	485	1037.54	485	100005.3823.	504
	50	1042.33	485	1042.39	485	100005.4327.	506
36	0	1047.18	485	2047.23	485	100005.4834.	509
	10	1052.03	485	1052.08	485	100005.5342.	511
	20	1056.87	485	1056.93	485	100005.5854.	514
	30	1061.72	485	1061.78	485	100005.6367.	516
	40	1066.57	485	1066.63	485	100005.6883.	518
	50	1071.42	485	1071.48	485	100005.7402.	521
37	0	1076.27	485	1076.32	485	100005.7922.	523
	10	1081.11	485	1081.18	485	100005.8445.	525
	20	1085.96	485	1086.02	485	100005.8971.	528
	30	1090.81	485	1090.87	485	100005.9498.	530
	40	1095.66	485	1095.72	485	100006.0029.	532
	50	1100.50	485	1100.57	485	100006.0561.	535
38	0	1105.35	485	1105.42	485	100006.1096.	537
	10	1110.20	485	1110.27	485	100006.1633.	540
	20	1115.05	485	1115.12	485	100006.2173.	541
	30	1119.90	485	1119.97	485	100006.2714.	544
	40	1124.74	485	1124.82	485	100006.3258.	547
	50	1129.59	485	1129.66	485	100006.3805.	549
39	0	1134.44	485	1134.51	485	100006.4354.	551
	10	1139.29	485	1139.36	485	100006.4905.	554
	20	1144.13	485	1144.21	485	100006.5459.	556
	30	1148.98	485	1149.06	485	100006.6015.	558
	40	1153.83	485	1153.91	485	100006.6573.	561
	50	1158.68	485	1158.76	485	100006.7134.	563
40	0	1163.53	485	1163.61	485	100006.7697.	565

89.Grad.

Prima	Secunda	Sinus	10''	Tangens	1''	Secans	1''	Inc.
	50	99994.7678.	495	9775242.	Vt in	9775754.	4635	4
	40	99994.7181.	497	9729129.	secan	9729643.	4591	4
	30	99994.6682.	499	9683449.	tibus	9683966.	4548	4
	20	99994.6180.	502	9638196.		9638715.	4506	4
	10	99994.5676.	504	9593364.		9593886.	4464	4
24	0	99994.5169.	506	9548947.		9549471.	4423	4
	50	99994.4660.	509	9504940.		9505466.	4382	4
	40	99994.4149.	511	9461336.		9461864.	4342	4
	30	99994.3636.	514	9418130.		9418661.	4302	4
	20	99994.3120.	516	9375317.		9375851.	4263	4
	10	99994.2601.	518	9332892.		9333428.	4225	4
23	0	99994.2081.	521	9290849.		9291387.	4187	4
	50	99994.1558.	523	9249182.		9249723.	4149	4
	40	99994.1033.	525	9207888.		9208431.	4113	4
	30	99994.0505.	528	9166961.		9167506.	4076	4
	20	99993.9975.	530	9126396.		9126944.	[illegible]	3
	10	99993.9443.	532	9086188.		9086739.	4004	3
22	0	99993.8908.	535	9046333.		9046886.	3970	3
	50	99993.8371.	537	9006827.		9007382.	3935	3
	40	99993.7831.	539	8967663.		8968221.	3901	3
	30	99993.7290.	542	8928839.		8929399.	3867	3
	20	99993.6745.	544	8890349.		8890912.	3834	3
	10	99993.6199.	546	8852190.		8852755.	3801	3
21	0	99993.5650.	549	8814357.		8814924.	3768	3
	50	99993.5099.	551	8776846.		8777416.	3736	3
	40	99993.4546.	553	8739653.		8740225.	3704	3
	30	99993.3990.	556	8702773.		8703348.	3674	3
	20	99993.3431.	558	8666204.		8666781.	3643	3
	10	99993.2871.	561	8629940.		8630520.	3612	3
20	0	99993.2308.	563	8593979.		8594561.	3582	3

0. Grad.

Prima	Secunda	Sinus	10″	Tangens	10″	Secans	10″
40	10	1168.37	485	1168.45	485	100006.8262.	568
	20	1173.22	485	1173.30	485	100006.8830.	570
	30	1178.07	485	1178.15	485	100006.9400.	572
	40	1182.91	485	1183.00	485	100006.9972.	575
	50	1187.76	485	1187.85	485	100007.0547.	577
41	0	1192.61	485	1192.70	485	100007.1124.	579
	10	1197.46	485	1197.55	485	100007.1703.	582
	20	1202.31	485	1202.40	485	100007.2885.	584
	30	1207.16	485	1207.24	485	100007.2869.	586
	40	1212.00	485	1212.09	485	100007.3456.	589
	50	1216.85	485	1216.94	485	100007.4045.	591
42	0	1221.70	485	1221.79	485	100007.4636.	594
	10	1226.55	485	1226.64	485	100007.5229.	596
	20	1231.40	485	1231.49	485	100007.5825.	598
	30	1236.24	485	1236.34	485	100007.6424.	601
	40	1241.09	485	1241.19	485	100007.7024.	603
	50	1245.94	485	1246.04	485	100007.7627.	605
43	0	1250.79	485	1250.88	485	100007.8232.	608
	10	1255.63	485	1255.73	485	100007.8840.	610
	20	1260.48	485	1260.58	485	100007.9450.	612
	30	1265.33	485	1265.43	485	100008.0063.	615
	40	1270.18	485	1270.28	485	100008.0677.	617
	50	1275.02	485	1275.13	485	100008.1294.	619
44	0	1279.87	485	1279.98	485	100008.1914.	622
	10	1284.72	485	1284.83	485	100008.2536.	624
	20	1289.57	485	1289.68	485	100008.3160.	626
	30	1294.41	485	1294.52	485	100008.3782.	629
	40	1299.26	485	1299.37	485	100008.4415.	631
	50	1304.11	485	1304.22	485	100008.5046.	634
45	0	1308.96	485	1309.07	485	100008.5680.	636

89. Grad.

Prima	Secunda	Sinus	10″	Tangens	1″	Secans	1″	Dif.
	50	99993.1743.	565	8558316.	V·in	8558900.	3513	3
	40	99993.1175.	568	8521948.	secan	8523535	3523	3
	30	99993.0605.	570	8487871.	tium	8488466	3464	3
	20	99993.0033.	572	8453081.		8453673	[illegible]	3
	10	99992.9458.	575	8418576.		8419170.	3438	3
19	0	99992.8881.	577	8384351.		8384947.	3410	3
	50	99992.8302.	579	8350403.		8351001.	3382	3
	40	99992.7720.	582	8316728.		8317330.	3355	3
	30	99992.7136.	584	8283325.		8283928.	3328	3
	20	99992.6549.	586	8250188.		8250794.	3301	3
	10	99992.5961.	589	8217316.		8217924.	3275	2
18	0	99992.5370.	591	8184704.		8185315.	3249	2
	50	99992.4776.	593	8152350.		8152963.	3224	2
	40	99992.4180.	596	8120251.		8120867.	3198	2
	30	99992.3582.	598	8088404.		8089022.	3173	2
	20	99992.2982.	600	8056805.		8057426.	3148	2
	10	99992.2379.	603	8025453.		8026076.	3124	2
17	0	99992.1774.	605	7994343.		7994968.	3100	2
	50	99992.1166.	608	7963473.		7964101.	3076	2
	40	99992.0556.	610	7932842.		7933472.	3052	2
	30	99991.9944.	612	7902444.		7903077.	3029	2
	20	99991.9329.	615	7872279.		7872914.	3006	2
	10	99991.8712.	617	7842343.		7842981.	2983	2
16	0	99991.8093.	619	7812634.		7813274.	2960	2
	50	99991.7471.	622	7783149.		7783792.	2938	2
	40	99991.6847.	624	7753886.		7754531.	2916	2
	30	99991.6221.	626	7724842.		7725489.	2894	2
	20	99991.5592.	629	7696015.		7696661.	2873	2
	10	99991.4961.	631	7667402.		7668054.	2851	2
15	0	99991.4328.	633	7639001.		7639655.	2830	2

O.Grad.

Prima	Secunda	Sinus	10″	Tangens	10″	Secans	10″
45	10	1313.81	485	1313.92	485	100008.6316.	638
	20	1318.65	485	1318.77	485	100008.6954.	641
	30	1323.50	485	1323.62	485	100008.7595.	643
	40	1328.35	485	1328.47	485	100008.8237.	645
	50	1333.20	485	1333.32	485	100008.8883.	648
46	0	1338.05	485	1338.17	485	100008.9530.	650
	10	1342.89	485	1343.01	485	100009.0180.	652
	20	1347.74	485	1347.86	485	100009.0833.	655
	30	1352.59	485	1352.71	485	100009.1487.	657
	40	1357.44	485	1357.56	485	100009.2144.	659
	50	1362.28	485	1362.41	485	100009.2804.	662
47	0	1367.13	485	1367.26	485	100009.3466.	664
	10	1371.98	485	1372.11	485	100009.4130.	666
	20	1376.83	485	1376.96	485	100009.4796.	669
	30	1381.67	485	1381.81	485	100009.5465.	671
	40	1386.52	485	1386.66	485	100009.6136.	673
	50	1391.37	485	1391.50	485	100009.6810.	676
48	0	1396.22	485	1396.35	485	100009.7485.	678
	10	1401.07	485	1401.20	485	100009.8164.	681
	20	1405.91	485	1406.05	485	100009.8844.	683
	30	1410.76	485	1410.90	485	100009.9527.	685
	40	1415.61	485	1415.75	485	100010.0212.	688
	50	1420.46	485	1420.60	485	100010.0900.	690
49	0	1425.30	485	1425.45	485	100010.1590.	692
	10	1430.15	485	1430.30	485	100010.2282.	695
	20	1435.00	485	1435.15	485	100010.2977.	697
	30	1439.85	485	1440.00	485	100010.3074.	699
	40	1444.69	485	1444.85	485	100010.4373.	702
	50	1449.54	485	1449.69	485	100010.5075	704
50	0	1454.39	485	1454.54	485	100010.5779	706

89.Grad.

Prima	Secunda	Sinus	10"	Tangens	1"	Secans	1"	Inc.
	50	99991.3692.	636	7610809.	Vt in	7611466.	2809	2
	40	99991.3054.	638	7582825.	secan	7583485.	2789	2
	30	99991.2413.	641	7555046.	tibus	7555708.	2768	2
	20	99991.1770.	643	7527470.		7528134.	2748	2
	10	99991.1125.	645	7500094.		7500761.	2728	2
14	0	99991.0478.	647	7472916.		7473585.	2709	2
	50	99990.9828.	650	7445935.		7446607.	2689	2
	40	99990.9175.	653	7419148.		7419822.	2670	2
	30	99990.8520.	655	7392553.		7393229.	2651	2
	20	99990.7864.	656	7366148.		7366826.	2632	2
	10	99990.7205.	659	7339930.		7340612.	2613	2
13	0	99990.6543.	662	7313899.		7314583.	2594	2
	50	99990.5879.	664	7288052.		7288738.	2576	2
	40	99990.5213.	666	7262386.		7263075.	2558	2
	30	99990.4544.	669	7236901.		7237592.	2540	2
	20	99990.3873.	671	7211594.		7212287.	2532	2
	10	99990.3200.	673	7186463.		7187159.	2505	2
12	0	99990.2524.	676	7161507.		7162265.	2487	2
	50	99990.1846.	678	7136723.		7137424.	2470	2
	40	99990.1166.	680	7112111.		7112814.	2453	2
	30	99990.0483.	683	7087668.		7088373.	2436	2
	20	99989.9798.	685	7063391.		7064099.	242[illegible]	2
	10	99989.9110.	688	7039281.		7039991.	2403	2
11	0	99989.8420.	690	7015335.		7016047.	2387	1
	50	99989.7728.	692	6991550.		6992266.	2371	1
	40	99989.7033.	695	6967927.		6968645.	2355	1
	30	99989.6337.	697	6944463.		6945183.	2339	1
	20	99989.5637.	700	6921156.		6921878.	2323	1
	10	99989.4936.	702	6898005.		6898730.	2308	1
10	0	99989.4232.	704	6875009.		6875736.	2292	1

O. Grad.

Prima	Secunda	Sinus	10″	Tangens	10″	Secans	10″
50	10	1459.24	485	1459.39	485	100010.6486.	708
	20	1464.08	485	1464.24	485	100010.7194.	712
	30	1468.93	485	1469.09	485	100010.7906.	713
	40	1473.78	485	1473.94	485	100010.8619.	716
	50	1478.63	485	1478.79	485	100010.9335.	718
51	0	1483.48	485	1483.64	485	100011.0053.	721
	10	1488.32	485	1488.49	485	100011.0774.	723
	20	1493.17	485	1493.34	485	100011.1497.	725
	30	1498.02	485	1498.19	485	100011.2222.	727
	40	1402.87	485	1503.04	485	100011.2949.	730
	50	1507.71	485	1507.88	485	100011.3679.	733
52	0	1512.56	485	1512.73	485	100011.441[illegible].	734
	10	1517.41	485	1517.58	485	100011.5146.	737
	20	1522.26	485	1522.43	485	100011.5883.	740
	30	1527.10	485	1527.28	485	100011.6623.	742
	40	1531.95	485	1532.13	485	100011.7364.	744
	50	1536.80	485	1536.98	485	100011.8108.	746
53	0	1541.65	485	1541.83	485	100011.8855.	749
	10	1546.49	485	1546.68	485	100011.9604.	751
	20	1551.34	485	1551.53	485	100012.0355.	753
	30	1556.19	485	1556.38	485	100012.1108.	756
	40	1561.04	485	1561.23	485	100012.1864.	758
	50	1565.88	485	1566.08	485	100012.2622.	760
54	0	1570.73	485	1570.93	485	100012.3383.	763
	10	1575.58	485	1575.77	485	100012.4146.	765
	20	1580.43	485	1580.62	485	100012.4911	767
	30	1585.27	485	1585.47	485	100012.5678.	770
	40	1590.12	485	1590.32	485	100012.6448.	773
	50	1594.97	485	1595.17	485	100012.7221	775
55	0	1599.82	485	1600.02	485	100012.7995	777

89.Grad.

Prima	Secunda	Sinus	1"	Tangens	1"	Secans	1"	Inc.
	50	99989.3526.	706	6852165.	Vt in	6852894.	2277	1
	40	99989.2817.	709	6829472.	secan	6830204.	2262	1
	30	99989.2106.	711	6806930.	tibus	6807664.	2247	1
	20	99989.1393.	713	6784535.		6785272.	2232	1
	10	99989.0677.	716	6762288.		6763027.	2218	1
9	0	99988.9959.	718	6740185.		6740927.	2203	1
	50	99988.9239.	720	6718227.		6718971.	2189	1
	40	99988.8516.	723	6696411.		6697158.	2175	1
	30	99988.7791.	725	6674737.		6675486.	2161	1
	20	99988.7663.	728	6653202.		6653954.	2147	1
	10	99988.6333.	730	6631806.		6632560.	2133	1
8	0	99988.5601.	732	6610547.		6611304.	2119	1
	50	99988.4867.	734	6589424.		6590183.	2106	1
	40	99988.4130.	737	6568435.		6569197.	2091	1
	30	99988.3391.	739	6547580.		6548344.	2079	1
	20	99988.2649.	742	6526857.		6527623.	2066	1
	10	99988.1905.	744	9506264.		6507032.	2053	1
7	0	99988.1159.	746	6485801.		6486572.	2040	1
	50	99988.0411.	748	6465466.		6466239.	2027	1
	40	99987.9660.	751	6445258.		6446034.	2015	1
	30	99987.8906.	753	6425176.		6425954.	2002	1
	20	99987.8151.	755	6405219.		6405999.	1990	1
	10	99987.7393.	758	6385385.		6386168.	1978	1
6	0	99987.6633.	760	6365674.		6366459.	1665	1
	50	99987.5870.	763	6346084.		6346872.	1953	1
	40	99987.5105.	765	6326614.		6327405.	1941	1
	30	99987.4337.	768	6307264.		6308056.	1929	1
	20	99987.3568.	769	6288031.		6288826.	1918	1
	10	99987.2795.	773	6268915.		6269713.	1906	1
5	0	99987.2021.	774	6249915.		6250715.	1895	1

O.Grad.

Prima	Secunda	Sinus	10″	Tangens	10″	Secans	10″
55	10	1604.66	485	1604.87	485	100012.8772.	779
	20	1609.51	485	1609.72	485	100012.9552.	781
	30	1614.36	485	1614.57	485	100013.0333.	784
	40	1619.21	485	1619.42	485	100013.1117.	787
	50	1624.05	485	1624.27	485	100013.1904.	788
56	0	1628.90	485	1629.12	485	100013.2692.	792
	10	1633.75	485	1633.97	485	100013.4484.	793
	20	1638.60	485	1638.82	485	100013.4277.	796
	30	1643.44	485	1646.67	485	100013.5073.	798
	40	1648.29	485	1648.52	485	100013.5871.	800
	50	1653.14	485	1653.37	485	100013.6671.	803
57	0	1657.99	485	1658.21	485	100013.7474.	806
	10	1662.83	485	1663.06	485	100013.8280.	807
	20	1667.68	485	1667.91	485	100013.9087.	810
	30	1672.53	485	1672.76	485	100013.9897.	812
	40	1677.38	485	1677.61	485	100014.0709.	815
	50	1682.22	485	1682.46	485	100014.1524.	817
58	0	1687.07	485	1687.31	485	100014.2341.	819
	10	1691.92	485	1692.16	485	100014.3160.	822
	20	1696.77	485	1697.01	485	100014.3982.	824
	30	1701.61	485	1701.86	485	100014.4806.	826
	40	1706.46	485	1706.71	485	100014.5632.	829
	50	1711.31	485	1711.56	485	100014.6461.	831
59	0	1716.16	485	1716.41	485	100014.7292.	834
	10	1721.00	485	1721.26	485	100014.8126.	835
	20	1725.85	485	1726.11	485	100014.8961.	838
	30	1730.70	485	1730.96	485	100014.9799.	841
	40	1735.55	485	1735.81	485	100015.0640.	843
	50	1740.39	485	1740.66	485	100015.1483.	845
60	0	1745.24	485	1745.51	485	100015.2328.	848

89.Grad.

Prima	Secunda	Sinus	10"	Tangens	1"	Secans	1"	Inc.
	50	99987.1244.	777	6231030.	Vt in	6231833.	1883	1
	40	99987.0465.	779	6212259.	secan	6213064.	1872	1
	30	99986.9684.	781	6193600.	tibus	6194407.	1861	1
	20	99986.8900.	784	6175053.		6175863.	1849	1
	10	99986.8114.	786	6156617.		6157429.	1838	1
4	0	99986.7325.	789	6138290.		6139105.	1827	1
	50	99986.6534.	791	6120073.		6120890.	1817	1
	40	99986.5741.	793	6101963.		6102782.	1806	1
	30	99986.4945.	796	6083960.		6084781.	1795	1
	20	99986.4147.	798	6066062.		6066887.	1785	1
	10	99986.3347.	800	6048270.		6049097.	1774	1
3	0	99986.2544.	803	6030582.		6031411.	1764	1
	50	99986.1739.	805	6012997.		6013828.	1754	1
	40	99986.0932.	807	5995514.		5996348.	1743	1
	30	99986.0122.	810	5978132.		5978969.	1733	1
	20	99985.9310.	812	5960851.		5961690.	1723	1
	10	99985.8496.	814	5943670.		5944511.	1713	1
2	0	99985.7679.	817	5926587.		5927431.	1704	1
	50	99985.6860.	819	5909602.		5910448.	1694	1
	40	99985.6039.	821	5892714.		5893563.	1684	1
	30	99985.5215.	824	5875923.		5876774.	1675	1
	20	99985.4389.	826	5859227.		5860080.	1665	1
	10	99985.3560.	829	5842625.		5843481.	1656	1
1	0	99985.2729.	831	5826117.		5826975.	1646	1
	50	99985.1896.	833	5809703.		5810563.	1637	1
	40	99985.1061.	835	5793380.		5794243.	1628	1
	30	99985.0223.	838	5777149.		5778014.	1619	1
	20	99984.9383.	840	5761008.		5761876.	1610	1
	10	99984.8540.	843	5744958.		5745828.	1601	1
0	0	99984.7695.	845	5729869.		5728996.	1592	1

1. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″	Inc.
1	1774.32	485	1774.60	485	100015.7449.	862	2
2	1803.41	485	1803.70	485	100016.2654.	876	2
3	1832.49	485	1832.80	485	100016.7944.	890	2
4	1861.58	485	1861.90	485	100017.3318.	904	2
5	1890.66	485	1891.00	485	100017.8778.	918	2
6	1919.74	485	1920.10	485	100018.4322.	932	2
7	1948.83	485	1949.20	485	100018.9951.	946	2
8	1977.91	485	1978.30	485	100019.5664.	960	2
9	2006.99	485	2007.40	485	100020.1452.	975	2
10	2036.08	485	2036.50	485	100020.7344.	989	2
11	2065.16	485	2065.60	485	100021.3312.	1003	2
12	2094.24	485	2094.70	485	100021.9364.	1017	2
13	2123.32	485	2123.80	485	100022.5501.	1031	2
14	2152.41	485	2152.90	485	100023.1723.	1045	2
15	2181.49	485	2182.01	485	100023.8029.	1059	2
16	2210.57	485	2211.11	485	100024.4420.	1073	2
17	2239.65	485	2240.21	485	100025.0896.	1088	2
18	2268.73	485	2269.32	485	100025.7456.	1102	2
19	2297.81	485	2298.42	485	100026.4102.	1136	2
20	2326.90	485	2327.53	485	100027.0832.	1139	2
21	2355.98	485	2356.63	485	100027.7646.	1144	2
22	2385.06	485	2385.74	485	100028.4546.	1158	2
23	2414.14	485	2414.84	485	100029.1530.	1272	2
24	2443.22	485	2443.95	485	100029.8599.	1286	2
25	2472.30	485	2473.05	485	100030.5753.	1200	2
26	2501.38	485	2502.16	485	100031.2991.	1215	2
27	2530.46	485	2531.27	485	100032.0314.	1229	2
28	2559.54	485	2560.38	485	100032.7722.	1243	2
29	2588.62	485	2589.48	485	100033.5215.	1257	2
30	2617.69	485	2618.59	485	100034.2792.	1271	2

88.Grad.

Prima	Sinus	10″	In	Tangens	10″	Inc.	Secans	10″	Inc.
59	99984.2576.	859	2	5635059.	15442	85	5635946.	15439	85
58	99983.7372.	877	2	5544159.	14947	81	5545053.	14945	81
57	99983.2084.	887	2	5456130.	14476	77	5457046.	14473	77
56	99982.6711.	901	2	5370856.	14026	73	5371790.	14024	73
55	99982.1254.	915	2	5288211.	13598	70	5289156.	13595	70
54	99981.5712.	929	2	5208067.	13188	67	5209027.	13186	67
53	99981.0085.	973	2	5130316.	12797	64	5131290.	12795	64
52	99980.4374.	958	2	5054851.	12423	61	5055840.	12421	61
51	99979.8578.	971	2	4981573.	12063	59	5982576.	12063	59
50	99979.2698.	986	2	4910388.	11723	56	4911406.	11720	56
49	99978.6733.	1000	2	4841208.	11394	54	4842241.	11392	54
48	99978.0683.	1014	2	4773950.	11080	52	4774997.	11077	52
47	99977.7549.	1028	2	4708534.	10778	49	4709596.	10776	49
46	99976.8330.	1042	2	4644886.	10488	47	4645963.	10486	47
45	99976.2127.	1056	2	4582935.	10210	46	4584026.	10208	46
44	99975.5639.	1071	2	4522614.	9943	44	4523719.	9941	44
43	99974.9166.	1085	2	4463860.	9686	41	4464980.	9684	41
42	99974.2609.	1099	2	4406611.	9419	40	4407746.	9637	40
41	99973.5966.	1112	2	4350812.	9202	39	4351961.	9200	39
40	99972.9241.	1126	2	4296408.	8973	38	4297571.	8970	38
39	99972.2430.	1141	2	4243346.	8752	36	4244525.	8750	36
38	99971.5555.	1156	2	4191579.	8540	35	4192772.	8538	35
37	99970.8554.	1170	2	4141059.	8335	34	4142266.	8333	34
36	99970.1490.	1184	2	4091741.	8138	32	4092963.	8135	32
35	99969.4340.	1198	2	4043584.	7947	31	4044820.	7945	31
34	99968.7106.	1211	2	3996546.	7763	30	3997797.	7761	30
33	99967.9788.	1225	2	3950589.	7586	29	3951855.	7584	29
32	99967.2385.	1239	2	3905677.	7417	28	3906957.	7412	28
31	99964.4897.	1254	2	3861774.	7249	27	3863068.	7246	27
30	99965.7325.	1268	2	3818846.	7084	26	3820155.	7086	26

1. Grad.

Prima	Sinus	10″	Targens	10″	Secans	0″	Inc.
31	2646.77	485	2647.70	485	100035.0454.	1295	2
32	2675.85	485	2676.81	485	100035.8201.	1299	2
33	2704.93	485	2705.92	485	100036.6033.	1213	2
34	2734.01	485	2735.03	485	100037.3949.	1328	2
35	2763.09	485	2764.14	485	100038.1951.	1344	2
36	2792.16	485	2793.25	485	100039.0037.	1356	2
37	2821.24	485	2822.36	485	100039.8207.	1370	2
38	2850.31	485	2851.48	485	100040.6463.	1384	2
39	2879.59	485	2880.59	485	100041.4803.	1348	2
40	2908.47	485	2909.70	485	100042.3229.	1412	2
41	2937.55	485	2938.82	485	100043.1738.	1427	2
42	2966.62	485	2967.93	485	100044.0333.	1441	2
43	2995.70	485	2997.04	485	100044.9013.	1455	2
44	3024.78	485	3026.16	485	100045.7777.	1469	2
45	3053.85	485	3055.28	485	100046.6626.	1483	2
46	3082.93	485	3084.39	485	100047.5560.	1497	2
47	3112.00	485	3113.51	485	100048.4579.	1511	2
48	3141.08	485	3142.63	485	100049.3683.	1525	2
49	3170.15	485	3171.74	485	100050.2871.	1540	2
50	3199.22	485	3200.86	485	100051.2145.	1554	2
51	3228.30	485	3229.98	485	100052.1503.	1568	2
52	3257.37	485	3259.10	485	100053.0946.	1582	2
53	3286.44	485	3288.22	485	100054.0473.	1596	2
54	3315.52	485	3317.34	485	100055.0186.	1610	2
55	3344.59	485	3346.46	485	100055.9784.	1624	2
56	3373.66	485	3375.58	485	100056.9566.	1639	2
57	3402.73	485	3404.71	485	100057.9433.	1652	2
58	3431.81	485	3433.83	485	100058.9385.	1667	2
59	3460.88	485	3462.95	485	100059.9422.	1681	2
60	3489.95	485	3492.08	485	100060.9544.	1695	2

88.Grad.

Prima	Sinus	10″	In	Tangens	10″	Inc.	Secans	10″	Inc.
29	99964 9668.	1283	2	3776861.	693[illegible]	25	3778185.	6931	25
28	99964.1926.	1297	2	3735789.	678[illegible]	24	3737127.	6781	24
27	99963.4100.	1310	2	3695600.	663[illegible]	23	3696953.	6636	23
26	99962.6190.	1324	2	3656266.	649[illegible]	22	3657633.	6495	22
25	99961.8194	1338	2	3617760.	6361	22	3619141.	6359	22
24	99961.0115.	1353	2	3580055.	6229	21	3581452.	6227	21
23	99960.1950.	1367	2	3543128.	6102	21	3544539.	6099	21
22	99959.3701.	1381	2	3506955.	5978	20	3508380.	5975	20
21	99958.5368.	1395	2	3471511.	5857	20	3472951.	5855	20
20	99957.6950.	1408	2	3436777.	5741	19	3438232.	5738	19
19	99956.8447.	1423	2	3402730.	5628	19	3404199.	5625	19
18	99955.9860.	1437	2	3369351.	5518	18	3370835.	5515	18
17	99955.1188.	1452	2	3336619.	5411	18	3338118.	5409	18
16	99954.2431.	1466	2	3304517.	5307	17	3306030.	5305	17
15	99953.3590.	1480	2	3273026.	5207	17	3274554.	5204	17
14	99952.4665.	1494	2	3242129.	5109	16	3243671.	5107	16
13	99951.5655.	1507	2	3211810.	5104	16	3213366.	5011	16
12	99950.6560.	1521	2	3182052.	4921	15	3183623.	4919	15
11	99949.7381.	1535	2	3152839.	4831	15	3154425.	4829	15
10	99948.8117.	1544	2	3124158.	4744	14	3125758.	4742	14
9	99947.8768.	1564	2	3095993.	4659	14	3097607.	4656	14
8	99946.9335.	1578	2	3068331.	4576	13	3069960.	4574	13
7	99945.9818.	1593	2	3041158.	4495	13	3042802.	4493	13
6	99945.0215.	1606	2	3014462.	4417	13	3016120.	4414	13
5	99944.0529.	1620	2	2988230.	4340	12	2989903.	4338	12
4	99943.0757.	1634	2	2962450.	4266	12	2964137.	4263	12
3	99942.0902.	1648	2	2937111.	4193	12	2938812.	4191	12
2	99941.0961.	1663	2	2912200.	4122	12	2913917.	4120	12
1	99940.0936.	1677	2	2887709.	4053	11	2889440.	4051	11
0	99939.0827.	1691	2	2863625.	3986	11	2865371.	3984	11

2. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″	Inc.
1	3519.02	484	3521.20	485	100061.9751.	1709	2
2	3548.09	484	3550.33	485	100063.0042.	1723	2
3	3577.16	484	3579.45	485	100064.0418.	1734	2
4	3606.23	484	3608.58	485	100065.0880.	1752	2
5	3635.30	484	3637.71	485	100066.1426.	1766	2
6	3664.37	484	3666.83	485	100067.2057.	1780	2
7	3693.44	484	3695.96	485	100068.2773.	1794	2
8	3722.51	484	3725.09	485	100069.3574.	1808	2
9	3751.58	484	3754.22	485	100070.4460.	1822	2
10	3780.64	484	3783.85	485	100071.5431.	1837	2
11	3809.71	484	3812.48	485	100072.6486.	1851	2
12	3838.78	484	3841.61	485	100073.7627.	1865	2
13	3867.85	484	3870.74	485	100074.8852.	1879	2
14	3896.91	484	3899.88	485	100076.0163.	1893	2
15	3925.98	484	3929.01	485	100077.1558.	1907	2
16	3955.05	484	3958.14	485	100078.3038.	1922	2
17	3984.11	484	3987.28	485	100079.4604.	1936	2
18	4013.18	484	4016.41	485	100080.6254.	1950	2
19	4042.24	484	4045.55	485	100081.7989.	1964	2
20	4071.40	484	4074.69	485	100082.9809.	1978	2
21	4100.37	484	4103.82	485	100084.1714.	1992	2
22	4129.44	484	4132.96	485	100085.3704.	2001	2
23	4158.50	484	4162.10	485	100086.5780.	2021	2
24	4187.56	484	4191.24	485	100087.7940.	2035	2
25	4216.63	484	4220.38	485	100089.0185.	2049	2
26	4285.69	484	4249.52	485	100090.2515.	2063	2
27	4274.75	484	4278.66	485	100091.4930.	2077	2
28	4303.82	484	4307.81	485	100092.7430.	2092	2
29	4332.88	484	4336.95	485	100094.0015.	2106	2
30	4361.94	484	4366.09	485	100095.2685.	2120	2

87.Grad.

Prima	Sinus	10″	Inc.	Tangens	1″	Inc.	Secans	1″	Inc.
59	99932.0632	1704	2	2839940.	3921	11	2841700.	3918	11
58	99937.0354	1719	2	2816642.	3856	11	2818417.	3854	11
57	99935.9990	1733	2	2793723.	3794	10	2795512.	3791	10
56	99934.9543	1747	2	2771174.	3733	10	2772978.	3730	10
55	99933.9010	1762	2	2748985.	3673	10	2750804.	3671	10
54	99932.8395	1776	2	2727149.	3615	10	2728981.	3613	10
53	99931.7692	1790	2	2705656.	3559	10	2707503.	3556	10
52	99930.6906	1803	2	2684498.	3503	10	2686360.	3501	10
51	99929.6035	1817	2	2663669.	3491	10	2665545.	3447	10
50	99928.5080	1831	2	2643160.	3396	10	2645051.	3394	10
49	99927.4040	1845	2	2622964.	3345	9	2624869.	3342	9
48	99926.2916	1860	2	2603074.	3294	8	2604994.	3292	8
47	99925.1707	1875	2	2583482.	3245	8	2585417.	3242	8
46	99924.0414	1889	2	2564183.	3196	8	2566132.	3194	8
45	99922.9036	1902	2	2545170.	3149	8	2547134.	3147	8
44	99921.7573	1916	2	2526436.	3103	8	2528414.	3101	8
43	99920.6026	1930	2	2507976.	3058	8	2509969.	3056	8
42	99919.4395	1944	2	2489783.	3014	8	2491790.	3011	8
41	99918.2679	1959	2	2471851.	2971	8	2473873.	2668	8
40	99917.0878	1973	2	2454176.	2928	8	2456212.	2926	8
39	99915.8993	1987	2	2436751.	2887	8	2438802.	2885	8
38	99914.7023	2000	2	2419571.	2846	7	2421637.	2844	7
37	99913.4969	2014	2	2402632.	2807	7	2404712.	2804	7
36	99912.2830	2014	2	2385928.	2768	7	2388022.	2766	7
35	99911.0606	2029	2	2369454.	2730	7	2371563.	2727	7
34	99909.8298	2043	2	2353205.	2693	7	2355329.	2690	7
33	99908.5906	2072	2	2337178.	2656	7	2339316.	2654	7
32	99907.3429	2086	2	2321367.	2620	6	2323510.	2618	6
31	99906.0867	2100	2	2305768.	2585	6	2307935.	2583	6
30	99904.8221	2113	2	2290377.	2551	6	2292559.	2548	6

G

2. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″	Inc.
31	4391.00	484	4395.24	486	100096.5440	2134	2
32	4420.06	484	4424.38	486	100097.8280	2148	2
33	4449.12	484	4453.53	486	100099.1205	2162	2
34	4478.18	484	4482.68	486	100100.4215	2178	2
35	4507.24	484	4511.82	486	100101.7310	2191	2
36	4536.30	484	4540.97	486	100103.0491	2205	2
37	4565.36	484	4570.12	486	100104.3756	2219	2
38	4594.42	484	4599.27	486	100105.7106	2233	2
39	4623.47	484	4628.42	486	100107.0542	2247	2
40	4652.53	484	4657.57	486	100108.4062	2262	2
41	4681.59	484	4686.73	486	100109.7668	2276	2
42	4710.64	484	4715.88	486	100111.1358	2290	2
43	4739.70	484	4745.03	486	100162.5134	2304	2
44	4768.76	484	4774.19	486	100113.8995	2318	2
45	4797.81	484	4893.34	486	100115.2941	2333	2
46	4826.87	484	4832.50	486	100116.6972	2347	2
47	4855.92	484	4861.66	486	100118.1088	2361	2
48	4884.98	484	4890.82	486	100119.5289	2375	2
49	4914.03	484	4919.97	486	100120.9576	2389	2
50	4943.08	484	4949.13	486	100122.3947	2403	2
51	4972.14	484	4978.29	486	100123.8404	2418	2
52	5001.19	484	5007.46	486	100125.2946	2432	2
53	5030.24	484	5036.62	486	100126.7572	2446	2
54	5059.29	484	5065.78	486	100128.2285	2460	2
55	5088.34	484	5094.94	486	100129.7082	2474	2
56	5117.40	484	5124.11	486	100131.1964	2489	2
57	5146.45	484	5153.28	486	100132.6932	2503	2
58	5175.50	484	5182.44	486	100134.1984	2517	2
59	5204.55	484	5211.61	486	100135.7122	2531	2
60	5233.60	484	5240.78	486	100137.2346	2545	2

87. Grad.

Prima	Sinus	10"	In	Tangens	10"	In	Secans	10"	In
29	99903.5490	2128	2	2275189.	2517	6	2277386.	2515	6
28	99902.2675	2142	2	2260201.	2484	6	2262413.	2482	6
27	99900.9776	2156	2	2245410.	2452	6	2247635.	2449	6
26	99899.6796	2170	2	2230810.	2420	6	2233050.	3418	6
25	99898.1723	2185	2	2216398.	2389	6	2218653.	2387	6
24	99897.0569	2199	2	2202171.	2358	6	2204440.	2356	6
23	99895.7332	2212	2	2188125.	2329	6	2190409.	2326	6
22	99894.4009	2226	2	2174257.	2299	6	2176555.	2297	6
21	99893.0602	2240	2	2160563.	2270	5	2162876.	2268	5
20	99891.7111	2255	2	2147040.	2242	5	2149368.	2240	5
19	99890.3535	2269	2	2133685.	2214	5	2136027.	2212	5
18	99888.9875	2282	2	2120495.	2187	5	2122851.	2185	5
17	99887.6130	2297	2	2107466.	2160	5	2109838.	2158	5
16	99886.2300	2310	2	2094597.	2134	5	2096982.	2132	5
15	99884.8386	2324	2	2081883.	2108	5	2084283.	2106	5
14	99883.4387	2339	2	2069322.	2083	5	2071737.	2081	5
13	99882.0304	2354	2	2056911.	2058	5	2059341.	2056	5
12	99880.6137	2368	2	2044649.	2034	5	2047093.	2031	5
11	99879.1885	2382	2	2032531.	2010	5	2034989.	2007	5
10	99877.7548	2396	2	2020555.	1986	5	2023028.	1984	5
9	99876.3127	2409	2	2008720.	1963	5	2011207.	1961	5
8	99874.8621	2423	2	1997022.	1940	4	1999524.	1938	4
7	99873.4031	2437	2	1985459.	1918	4	1987976.	1915	4
6	99871.9357	2452	2	1974029.	1896	4	1976560.	1893	4
5	99870.4598	2466	2	1962730.	1874	4	1965275.	1872	4
4	99868.9754	2480	2	1951558.	1853	4	1954119.	1851	4
3	99867.4826	2494	2	1940513.	1832	3	1943088.	1830	3
2	99865.9813	2507	2	1929592.	1812	3	1932182.	1809	3
1	99864.4716	2522	2	1918793.	1791	3	1921397.	1789	3
0	99862.9534	2536	2	1908114.	1772	3	1910732.	1769	3

3.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	5262.64	484	5269.95	486	100138.765	256
2	5291.69	484	5299.12	486	100140.305	257
3	5320.74	484	5328.29	486	100141.853	259
4	5349.79	484	5357.46	486	100143.409	260
5	5378.83	484	5386.63	486	100144.974	262
6	5407.88	484	5415.81	486	100146.547	264
7	5436.93	484	5444.90	486	100148.129	264
8	5465.97	484	5474.16	486	100149.720	266
9	5495.02	484	5503.33	486	100151.319	267
10	5524.06	484	5532.51	486	100152.926	269
11	5553.11	484	5561.69	486	100154.542	270
12	5582.15	484	5590.87	486	100156.167	271
13	5611.19	484	5620.05	486	100157.800	273
14	5640.24	484	5649.23	486	100159.442	274
15	5669.28	484	5678.41	486	100161.092	276
16	5698.32	484	5707.59	486	100162.751	277
17	5727.36	484	5736.78	486	100164.418	279
18	5756.40	484	5765.96	486	100166.094	288
19	5785.44	483	5795.15	486	100167.778	281
20	5814.48	484	5824.34	486	100169.471	283
21	5843.52	484	5853.52	486	100171.172	284
22	5872.56	484	1882.71	486	100172.882	286
23	5901.60	484	5911.90	487	100174.601	287
24	5930.64	484	5941.09	487	100176.327	289
25	5959.67	484	5970.29	487	100178.063	290
26	5988.71	484	5994.48	487	100179.807	291
27	6017.75	484	6028.67	487	100188.560	293
28	6046.78	484	6057.87	487	100183.321	294
29	6075.82	484	6087.06	487	100185.090	296
30	6104.85	484	6116.26	487	100186.869	297

86.Grad.

Prima	Sinus	10"	Tangens	10"	Inc.	Secans	10"	Inc.
59	99861.427	255	1897552.	1750	3	1900185.	1750	3
58	99859.892	256	1887107.	1731	3	1889754.	1730	3
57	99858.348	258	1876775.	1712	3	1879438.	1712	3
56	99856.796	259	1866556.	1693	3	1869233.	1693	3
55	99855.236	261	1856447.	1675	3	1859139.	1675	3
54	99853.667	262	1846447.	1657	3	1849153.	1657	3
53	99852.090	263	1836554.	1639	3	1839274.	1639	3
52	99850.504	265	1826765.	1622	3	1829500.	1622	3
51	99848.910	266	1817081.	1605	3	1819830.	1605	3
50	99847.307	268	1807498.	1588	3	1810262.	1588	3
49	99845.696	269	1798915.	1571	3	1800794.	1571	3
48	99844.076	270	1788631.	1555	3	1791424.	1555	3
47	99842.448	272	1779344.	1539	3	1782152.	1539	3
46	99840.812	273	1770153.	1523	3	1771975.	1523	3
45	99839.167	275	1761056.	1507	3	1763893.	1507	3
44	99837.514	276	1752052.	1492	3	1754903.	1492	3
43	99835.852	278	1743139.	1477	2	1746005.	1477	2
42	99834.182	279	1734315.	1462	2	1737196.	1462	2
41	99832.503	280	1725581.	1447	2	1728476.	1447	2
40	99830.816	282	1716934.	1433	2	1719843.	1433	2
39	99829.120	283	1708372.	1419	2	1711297.	1419	2
38	99827.416	285	1699896.	1405	2	1702835.	1405	2
37	99825.704	286	1691503.	1391	2	1694456.	1391	2
36	99823.983	287	1683191.	1377	2	1686159.	1377	2
35	99822.253	289	1674961.	1364	2	1677944.	1364	2
34	99820.515	290	1666811.	1350	2	1669808.	1350	2
33	99818.770	292	1658740.	1337	2	1661751.	1337	2
32	99817.015	293	1650746.	1325	2	1653772.	1325	2
31	99815.251	294	1642828.	1312	2	1645869.	1312	2
30	99813.480	296	1634986.	1300	2	1638041.	1300	2

3. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	6133.89	484	6145.46	487	100188.655	299
32	6162.92	484	6174.66	487	100190.451	300
33	6191.95	484	6203.86	487	100192.254	301
34	6220.99	484	6233.06	487	100194.067	303
35	6250.02	484	6262.26	487	100195.888	304
36	6279.05	484	6291.47	487	100197.717	306
37	6308.08	484	6320.67	487	100199.555	307
38	6337.11	484	6349.88	487	100201.402	309
39	6366.14	484	6379.08	487	100203.257	310
40	6395.17	484	6408.29	487	100205.121	311
41	6424.20	484	6437.50	487	100206.993	313
42	6453.23	484	6466.71	487	100208.873	314
43	6482.26	484	6495.92	487	100210.763	316
44	6511.29	484	6525.13	487	100212.661	317
45	6540.31	484	6554.35	487	100214.567	319
46	6569.34	484	6583.56	487	100216.482	310
47	6598.36	484	6612.78	487	100218.405	321
48	6627.39	484	6641.99	487	100220.337	323
49	6656.41	484	6671.21	487	100222.278	324
50	6685.44	484	6700.43	487	100224.227	326
51	6714.46	484	6729.65	487	100226.185	327
52	6743.48	484	6758.87	487	100228.151	329
53	6772.51	484	6788.09	487	100230.126	321
54	6801.53	484	6817.32	487	100232.110	331
55	6830.55	484	6846.54	487	100234.101	333
56	6859.57	484	6875.77	487	100236.102	334
57	6888.59	484	6904.99	487	100238.111	336
58	6917.61	484	6934.22	487	100240.129	337
59	6946.63	484	6963.45	487	100242.155	339
60	6975.65	484	6992.68	487	100244.190	340

86.Grad.

Prima	Sinus	10"	Inc.	Tangens	1"	Inc	Secans	1"	Inc.
29	99811.700	297	2	1627217.	1290	2	1630287.	1287	2
28	99809.911	299	2	1619523.	1277	2	1622607.	1275	2
27	99800.114	300	2	1611900.	1265	2	1614999.	1363	2
26	99806.309	301	2	1304348.	1254	2	1607462.	1251	2
25	99804.495	303	2	1596867.	1242	2	1599995.	1240	2
24	99802.673	304	2	1589454.	1231	2	1592597.	1228	2
23	99800.842	306	2	1582110.	1219	2	1585268.	1217	2
22	99799.003	307	2	1574834.	1208	2	1578005.	1206	2
21	99797.155	309	2	1567623.	1197	2	1570810.	1195	2
20	99795.300	310	2	1560478.	1186	2	1563679.	1184	2
19	99793.435	311	2	1553398.	1176	2	1556613.	1173	2
18	99791.562	313	2	1546381.	1165	2	1549611.	1163	2
17	99783.680	314	2	1539428.	1155	2	1542672.	1152	2
16	99787.791	316	2	1532536.	1144	2	1535795.	1142	2
15	99785.892	317	2	1525705.	1134	2	1528979.	1132	2
14	99783.986	318	2	1518935.	1124	2	1522223.	1122	2
13	99782.070	320	2	1512224.	1114	2	1515527.	1112	2
12	99780.147	321	2	1505572.	1105	2	1508890.	1102	2
11	99778.215	322	2	1498978.	1095	2	1502310.	1093	2
10	99776.274	324	2	1492442.	1085	2	1495788.	1083	2
9	99774.325	325	2	1485962.	1076	2	1489323.	1074	2
8	99772.368	327	2	1479537.	1067	1	1482913.	1064	1
7	99760.402	328	2	1473168.	1058	1	1476558.	1055	1
6	99768.428	330	2	1466853.	1049	1	1470258.	1046	1
5	99766.445	331	2	1460592.	1040	1	1464011.	1037	1
4	99764.454	332	2	1454383.	1031	1	1457817.	1029	1
3	99762.454	334	2	1448227.	1022	1	1451676.	1020	1
2	99760.446	335	2	1442123.	1014	1	1445586.	1011	1
1	99758.430	337	2	1436070.	1005	1	1439547.	1003	1
0	99556.405	338	2	1430067.	1997	1	1433559.	1995	1

4.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	Incr.
1	7004.66	484	7021.91	487	100246.233	341
2	7033.68	484	7051.15	487	100248.285	343
3	7062.70	484	7080.38	487	100250.346	344
4	7091.71	484	7109.61	487	100252.415	346
5	7120.73	484	7138.85	487	100254.492	347
6	7149.74	484	7168.09	487	100256.578	348
7	7178.76	484	7197.33	487	100258.673	350
8	7207.77	484	7226.57	487	100260.776	351
9	7236.78	484	7255.81	487	100262.888	353
10	7265.80	484	7285.05	487	100265.009	354
11	7294.81	484	7314.30	487	100267.138	356
12	7323.82	484	7343.54	487	100269.275	357
13	7352.83	483	7372.79	487	100271.422	358
14	7381.84	483	7402.03	487	100273.576	360
15	7410.85	483	7431.28	487	100275.740	361
16	7439.86	483	7460.53	488	100277.912	363
17	7468.86	483	7489.78	488	100280.092	364
18	7497.87	483	7519.04	488	100282.281	366
19	7526.88	483	7548.29	488	100284.479	367
20	7555.88	483	7577.55	488	100286.685	368
21	7584.89	483	7606.80	488	100288.900	370
22	7613.89	483	7636.06	488	100291.123	371
23	7642.90	483	7665.32	488	100293.355	373
24	7671.90	483	7694.58	488	100295.596	374
25	7700.91	483	7723.84	488	100297.845	376
26	7729.91	483	7753.10	488	100300.103	377
27	7758.91	483	7782.37	488	100302.369	379
28	7787.91	483	7811.63	488	100304.644	380
29	7816.91	483	7840.90	488	100306.928	381
30	7845.91	483	7870.17	488	100309.220	383

85. Grad.

Prima	Sinus	10"	Tangens	10"	Inc.	Secans	10"	Inc.
59	99754.372	340	1424113.	989	1	1427620.	986	1
58	99752.320	341	1418209.	981	1	1421730.	978	1
57	99750.279	342	1412354.	973	1	1415889.	970	1
56	99748.221	344	1406546.	965	1	1410096.	962	1
55	99746.154	346	1400786.	957	1	1494350.	954	1
54	99744.078	347	1395072.	949	1	1398651.	947	1
53	99741.994	348	1389404.	941	1	1392999.	939	1
52	99739.902	344	1383783.	934	1	1387391.	931	1
51	99737.801	351	1379206.	926	1	1381829.	924	1
50	99735.691	352	1372674.	919	1	1376311.	917	1
49	99733.574	354	1367186.	912	1	1370838.	909	1
48	99731.448	355	1361741.	904	1	1365408.	902	1
47	99729.313	356	1356339.	897	1	1360021.	895	1
46	99727.170	358	1350980.	890	1	1354676.	888	1
45	99725.018	359	1345663.	883	1	1349373.	881	1
44	99722.899	361	1340387.	879	1	1344112.	874	1
43	99720.690	362	1335152.	870	1	1338891.	867	1
42	99718.513	363	1329957.	893	1	1333712.	860	1
41	99716.328	365	1324803.	856	1	1328572.	854	1
40	99714.134	366	1319688.	850	1	1323472.	847	1
39	99711.932	368	1314613.	843	1	1318411.	841	1
38	99709.722	369	1309576.	837	1	1313388.	824	1
37	99707.503	370	1304577.	830	1	1308404.	828	1
36	99705.275	372	1299616.	824	1	1303458.	822	1
35	99703.039	373	1294692.	818	1	1298549.	810	1
34	99700.795	375	1289806.	812	1	1293677.	809	1
33	99698.542	379	1284956.	806	1	1288841.	803	1
32	99696.281	377	1284042.	800	1	1284042.	797	1
31	99694.211	379	1275363.	794	1	1279278.	791	1
30	99691.733	380	1270620.	788	1	1274549.	786	1

4. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	7874.91	483	7899.44	488	100311.520	384
32	7903.91	483	7928.71	488	100313.830	386
33	7932.90	483	7957.98	488	100316.148	387
34	7961.90	483	7987.26	488	100318.474	389
35	7990.90	483	8016.53	488	100320.809	390
36	8019.89	483	8045.81	488	100323.153	391
37	8048.89	483	8075.09	488	100325.505	393
38	8077.88	483	8104.37	488	100327.866	394
39	8106.87	483	8133.65	488	100330.236	396
40	8135.87	483	8162.93	488	100332.614	397
41	8164.86	483	8192.21	488	100335.001	399
42	8193.85	483	8221.50	488	100337.396	400
43	8222.84	483	8250.78	488	100339 800	401
44	8251.83	483	8280.07	488	100342.212	403
45	8280.82	483	8309.36	488	100344.633	404
46	8309.81	483	8338.65	488	100347.063	406
47	8338.80	483	8367.94	488	100349.501	407
48	8367.78	483	8397.23	488	100351.948	409
49	8396.77	483	8426.53	488	100354.404	410
50	8425.76	483	8455.82	488	100356.868	412
51	8454.74	483	8485.12	488	100359.341	413
52	8483.73	483	8514.42	488	100361.822	414
53	8512.71	483	8543.72	488	100364.312	416
54	8541.69	483	8573.02	488	100366.820	417
55	8570.67	483	8602.33	488	100369.318	419
56	8599.66	483	8631.63	488	100371.834	420
57	8628.64	483	8660.94	488	100374.359	422
58	8657.62	483	8690.25	488	100376.892	423
59	8686.60	483	8719.56	488	100379.433	424
60	8715.57	483	8748.87	488	100381.984	426

85.Grad.

Prima	Sinus	10″	Tangens	10″	Inc.	Secans	10″	Inc.
29	99689.447	382	1265912.	782	1	1269856.	780	1
28	99687.152	383	1261239.	777	1	1265197.	774	1
27	99684.849	384	1256600.	771	1	1260572.	768	1
26	99682.537	386	1251994.	765	1	1255981.	763	1
25	99680.217	387	1247422.	760	1	1251424.	757	1
24	99677.888	389	1242883.	754	1	1246899.	752	1
23	99675.551	380	1238377.	749	1	1242408.	746	1
22	99673.205	382	1233903.	743	1	1237948.	741	1
21	99670.851	393	1229461.	738	1	1233521.	736	1
20	99668.489	394	1225051.	733	1	1229125.	730	1
19	99666.118	396	1220672.	728	1	1224761.	725	1
18	99663.739	398	1216324.	723	1	1220427.	720	1
17	99661.351	399	1212006.	717	1	1216125.	715	1
16	99658.955	310	1207719.	712	1	1211852.	710	1
15	99656.550	401	1203462.	707	1	1207610.	705	1
14	99654.137	403	1199235.	702	1	1203397.	700	1
13	99651.716	404	1195037.	698	1	1199214.	695	1
12	99649.285	406	1190868.	693	1	1195059.	690	1
11	99646.848	407	1186728.	688	1	1190934.	686	1
10	99644.401	408	1182617.	683	1	1186837.	681	1
9	99641.946	410	1178533.	679	1	1182768.	676	1
8	99639.482	411	1174478.	674	1	1178727.	672	1
7	99637.010	413	1170450.	669	1	1174714.	667	1
6	99634.530	414	1166450.	665	1	1170728.	662	1
5	99632.041	415	1162476.	660	1	1166769.	668	1
4	99629.543	417	1158529.	656	1	1162837.	653	1
3	99627.038	418	1154609.	652	1	1158932.	649	1
2	99624.523	420	1150715.	647	1	1155052.	645	1
1	99622.001	421	1146847.	643	1	1151199.	640	1
0	99619.470	422	1143005.	639	1	1147371.	636	1

5. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	8744.55	483	8778.18	489	100384.543	427
2	8773.53	483	8807.49	489	100387.110	429
3	8802.50	483	8836.81	489	100389.687	430
4	8831.48	483	8866.12	489	100392.271	432
5	8860.46	483	8895.44	489	100394.865	433
6	8889.43	483	8924.76	489	100392.467	435
7	8918.40	483	8954.08	489	100400.078	436
8	8947.37	483	8983.41	489	100402.697	437
9	8976.35	483	9012.73	489	100405.325	439
10	9005.32	483	9042.06	489	100407.962	440
11	9034.29	483	9071.38	489	100410.607	442
12	9063.26	483	9100.71	489	100413.261	443
13	9092.23	483	9130.04	489	100415.923	445
14	9121.19	483	9159.37	489	100418.595	446
15	9150.16	483	9188.71	489	100421.274	447
16	9179.13	483	9218.04	489	100423.963	449
17	9208.09	483	9247.38	489	100426.660	450
18	9237.06	483	9276.72	489	100429.366	452
19	9266.02	483	9306.06	489	100432.086	453
20	9294.99	483	9335.40	489	100434.080	455
21	9323.95	483	9364.74	489	100437.535	456
22	9352.91	483	9394.09	489	100440.275	458
23	9381.87	483	9423.43	489	100443.024	459
24	9410.83	483	9452.78	489	100445.782	460
25	9439.79	483	9482.13	489	100448.548	462
26	9468.75	483	9511.48	489	100451.323	463
27	9497.71	483	9540.84	489	100454.107	465
28	9526.66	483	9570.19	489	100456.899	466
29	9555.62	483	9599.55	489	100459.700	468
30	9584.57	483	9628.90	489	100462.509	469

84.Grad.

Prima	Sinus	10"	Tangens	1"	In	Secans	1"	In
59	99616.930	424	1139188.49	63437	70	1143569.16	63194	70
58	99614.382	425	1135396.96	63018	69	1139792.20	62775	69
57	99611.826	427	1131630.40	62604	69	1136040.21	62361	69
56	99609.261	428	1127888.55	62193	68	1132312.93	61951	68
55	99606.689	429	1124171.17	61787	67	1128610.13	61544	67
54	99604.107	431	1120478.03	61385	67	1124931.56	61142	67
53	99601.516	432	1116808.88	60987	66	1121276.99	60744	66
52	99598.918	434	1113163.50	60592	66	1117646.17	60349	66
51	99596.311	435	1109541.64	60202	65	1114038.90	59959	65
50	99593.696	436	1105943.09	59815	64	1110454.92	59572	64
49	99591.072	438	1102367.63	59431	63	1106894.02	59189	63
48	99588.440	439	1098815.01	59051	62	1103355.99	58801	62
47	99585.800	440	1095285.04	58677	62	1099840.59	58434	62
46	99583.150	442	1091777.49	58304	61	1096347.61	58062	61
45	99580.493	443	1088292.14	57935	61	1092876.84	57693	61
44	99577.827	445	1084828.80	57570	60	1089428.07	57328	60
43	99575.153	446	1081387.24	57209	60	1086001.09	56966	60
42	99572.470	448	1077967.27	56851	59	1082595.69	56608	59
41	99569.779	449	1074568.68	56496	59	1079211.67	56253	59
40	99567.079	450	1071191.26	56144	58	1075848.84	55901	58
39	99564.371	452	1967834.83	55796	58	1072506.99	55553	58
38	99561.655	453	1064499.19	55450	57	1069185.92	55207	57
37	99558.930	455	1061184.14	55109	57	1065885.45	54866	57
36	99556.196	456	1057889.50	54770	56	1062605.38	54527	56
35	99553.454	458	1054615.07	54434	56	1059345.53	54191	56
34	99550.705	459	1051360.67	54102	55	1056105.70	53859	55
33	99547.946	460	1048126.11	53772	55	1052885.72	53529	55
32	99545.179	462	1044911.22	53446	54	1049685.41	53203	54
31	99542.404	463	1041715.81	53122	54	1046504.58	52879	54
30	99539.620	465	1038539.74	52802	53	1043343.05	52559	53

5.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	9613.53	483	9658.26	499	100465.328	471
32	9642.48	483	9687.62	489	100468.154	472
33	9671.44	483	9716.99	499	100470.990	473
34	9700.39	483	9746.55	489	100473.834	475
35	9729.34	483	9775.72	489	100476.687	476
36	9758.29	482	9805.09	489	100479.549	478
37	9787.24	482	9834.45	489	100482.419	479
38	9816.19	482	9863.83	490	100485.298	481
39	9845.14	482	9893.20	490	100488.185	482
40	9874.08	482	9922.57	490	100491.081	484
41	9903.03	482	9951.95	490	100493.986	485
42	9931.97	482	9981.33	490	100496.900	486
43	9960.92	482	10010.71	490	100499.822	488
44	9989.86	482	10040.09	490	100502.753	489
45	10018.81	482	10069.47	490	100505.693	491
46	10047.75	482	10098.85	490	100508.640	492
47	10076.69	482	10128.24	490	100511.598	494
48	10105.63	482	10157.63	490	100514.563	395
49	10134.57	482	10187.02	490	100517.538	497
50	10163.51	482	10216.41	490	100520.521	498
51	10192.45	482	10245.80	490	100523.512	499
52	10221.38	482	10275.20	490	100526.513	501
53	10250.32	482	10304.60	490	100529.522	502
54	10279.25	482	10333.99	490	100532.539	504
55	10308.19	482	10363.39	490	100535.566	505
56	10337.12	482	10392.80	490	100538.601	507
57	10366.05	482	10422.20	490	100541.644	508
58	10394.99	482	10451.61	490	100544.697	510
59	10423.92	482	10481.01	490	100547.758	511
60	10452.85	482	10510.42	490	100550.828	512

84.Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	99536.828	466	1035382.74	52484	53	1040200.66	52241	53
28	99534.027	467	1032244.73	52169	52	1037077.23	51926	52
27	99531.218	469	1029125.51	51857	52	1033972.59	51614	52
26	99528.400	470	1026024.90	51548	51	1030886.56	51305	51
25	99525.574	472	1022942.76	51242	51	1027818.99	50999	51
24	99522.740	473	1019878.89	50938	50	1024769.71	50695	50
23	99519.897	474	1016833.16	50637	50	1021738.55	50394	50
22	99517.046	476	1013805.39	50339	50	1018725.36	50096	50
21	99514.186	477	1010795.42	50043	49	1015729.98	49800	49
20	99511.318	479	1007803.11	49750	49	1012752.24	49507	49
19	99508.442	480	1004828.28	49460	48	1009792.00	49217	48
18	99505.557	481	1001870.80	49172	48	1006849.09	48929	48
17	99502.664	483	998930.50	48886	47	1003923.38	48643	47
16	99499.762	484	996007.24	48603	47	1001014.70	48360	47
15	99496.852	486	993100.88	48323	47	998122.91	48080	47
14	99493.933	487	990211.25	48045	46	995247.87	47802	46
13	99491.006	488	987338.23	47769	46	992389.43	47526	46
12	99488.071	490	984481.66	47496	45	989547.44	47253	45
11	99485.127	491	981641.40	47225	45	986721.76	46982	45
10	99482.174	493	978817.32	46956	46	983912.26	46713	46
9	99479.214	494	976009.27	46690	44	981118.80	46447	44
8	99476.245	495	973217.13	46426	44	978341.24	46183	44
7	99473.268	497	970440.75	46164	43	975579.44	45921	43
6	99470.282	498	967680.00	45905	43	972833.27	45661	43
5	99467.287	401	964934.74	45647	43	970102.60	45404	43
4	99464.285	501	962204.86	45392	42	967387.30	45149	42
3	99461.273	502	959490.22	45139	42	964687.24	44896	42
2	99458.254	504	956790.68	44888	42	962002.29	44645	42
1	99455.226	505	954106.13	44639	41	959332.33	44396	41
0	99452.180	507	951436.44	44392	41	956677.22	44149	41

6.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	10481.77	482	10539.83	490	100553.906	514
2	10510.70	482	10569.25	490	100556.994	515
3	10539.63	482	10598.66	490	100560.090	517
4	10568.56	482	10628.08	490	100563.194	518
5	10597.48	482	10657.50	490	100566.308	520
6	10626.41	482	10686.92	490	100569.430	521
7	10655.33	482	10716.34	490	100572.560	523
8	10684.25	482	10745.76	490	100575.700	524
9	10713.17	482	10775.19	490	100578.848	526
10	10742.10	482	10804.62	490	100582.005	527
11	10771.02	482	10834.04	490	100585.171	528
12	10799.94	482	10863.48	491	100588.345	530
13	10828.85	482	10892.91	491	100591.528	531
14	10857.77	482	10922.34	491	100594.720	533
15	10886.69	482	10951.78	491	100597.920	534
16	10915.60	482	10981.22	491	100601.129	536
17	10944.52	482	11010.66	491	100604.347	537
18	10973.43	482	11040.10	491	100607.574	539
19	11002.34	482	11069.55	491	100610.809	540
20	11031.26	482	11098.99	491	100614.053	542
21	11060.17	482	11128.44	491	100617.306	543
22	11089.08	482	11157.89	491	100620.567	544
23	11117.98	482	11187.34	491	100623.837	546
24	11146.89	482	11216.80	491	100627.116	547
25	11175.80	482	11246.25	491	100630.404	549
26	11204.71	482	11275.71	491	100633.700	550
27	11233.61	482	11305.17	491	100637.005	552
28	11262.52	482	11334.63	491	100640.319	553
29	11291.42	482	11364.09	491	100643.642	555
30	11320.32	482	11393.56	491	100646.973	556

83.Grad.

Prima	Sinus	10"	Tangens	10"	Inc	Secans	10"	Inc.
59	99449.145	508	948781.49	44147	41	954036.86	43904	41
58	99446.091	509	946141.15	43905	40	951411.10	43662	40
57	99443.030	511	943515.31	43664	40	948799.84	43421	40
56	99439.960	512	940903.84	43425	40	946202.96	43182	40
55	99436.881	514	938306.63	43188	39	943620.33	42945	39
54	99433.794	515	935723.55	42954	39	941051.84	42710	39
53	99430.599	516	933154.50	42721	39	938497.38	42478	39
52	99427.595	518	930599.36	42490	38	935956.82	42246	38
51	99424.483	519	928058.01	42260	38	933430.06	42017	38
50	99421.363	521	925530.35	42033	38	930916.99	41790	38
49	99418.234	522	923016.27	41808	37	928417.49	41564	37
48	99415.096	523	920515.64	41584	37	925931.45	41341	37
47	99411.951	525	918028.38	41362	37	923458.77	41119	37
46	99408.796	526	915554.36	41442	37	929999.34	40899	37
45	99405.634	628	913093.48	40924	36	918553.05	40681	36
44	99402.463	529	910645.64	40707	36	916119.80	40464	36
43	99399.283	530	908210.74	40492	36	913699.48	40249	36
42	99396.096	532	905788.67	40279	35	911292.00	40036	35
41	99392.899	533	903379.33	40068	35	908907.25	39825	35
40	99389.695	535	900982.61	39858	35	906515.12	39615	35
39	99386.482	536	898598.43	39680	35	904145.53	39407	35
38	99383.260	537	896226.68	39443	34	901788.37	39200	34
37	99380.030	539	893867.26	39238	34	899443.54	38995	34
36	99376.792	540	891520.08	39035	34	897110.95	38792	34
35	99373.545	542	889185.05	38833	33	894790.51	38590	33
34	99370.290	543	886862.06	38633	33	892482.11	38390	33
33	99367.027	544	884551.03	38435	33	890185.67	38191	33
32	99363.755	546	882251.85	38238	33	887901.08	37994	33
31	99360.474	547	879964.46	38042	32	885628.28	37999	32
30	99357.186	549	877688.73	37848	32	883367.15	37605	32

6. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	11349.22	482	11423.03	491	100650.313	558
32	11378.12	482	11452.50	491	100653.662	559
33	11407.02	482	11481.97	491	100657.020	560
34	11435.92	482	11511.44	491	100660.386	562
35	11464.82	482	11540.92	491	100663.761	563
36	11493.71	482	11570.39	491	100667.145	565
37	11522.61	482	11599.87	491	100670.537	566
38	11551.50	482	11629.35	491	100673.939	568
39	11580.40	482	11658.84	491	100677.349	569
40	11609.29	482	11688.32	491	100680.767	571
41	11638.18	482	11717.81	491	100684.195	572
42	11667.07	481	11747.30	491	100687.631	574
43	11695.96	481	11776.79	492	100691.076	575
44	11724.85	481	11806.28	492	100694.530	576
45	11753.74	481	11835.78	492	100697.992	578
46	12782.63	481	11865.28	492	100701.464	579
47	11811.51	481	11894.78	492	100704.944	581
48	11840.40	481	11924.28	492	100708.433	582
49	11869.28	481	11953.78	492	100711.930	584
50	11898.16	481	11983.29	492	100715.437	585
51	11927.04	481	12012.79	492	100718.952	587
52	11955.93	481	12042.30	492	100722.476	588
53	11984.80	481	12071.82	492	100726.008	590
54	12013.68	481	12101.33	492	100729.550	591
55	12042.56	481	12130.84	492	100733.100	593
56	12071.44	481	12160.36	492	100736.659	594
57	12100.31	481	12189.88	492	100740.227	595
58	12129.19	481	12219.41	492	100743.803	597
59	12158.06	481	12248.93	492	100747.389	598
60	12186.93	481	12278.46	492	100750.983	600

83.Grad.

Prima	Sinus	10"	Tangens	10"	In.	Secans	10"	Inc.
29	99353.888	550	875424.61	37655	32	881117.61	37412	32
28	99350.583	552	873171.98	37464	32	878879.57	37221	32
27	99347.269	553	870930.76	37275	31	876652.95	37031	31
26	99343.947	554	868700.88	37086	31	874437.66	36843	31
25	99340.616	55[illegible]	866482.23	36800	31	872233.61	36656	31
24	99337.277	558	864274.75	36714	31	870040.71	36471	31
23	99333.929	559	862078.33	36530	31	867858.89	36287	31
22	99330.573	560	859892.90	36347	30	865688.05	36105	30
21	99327.209	561	857718.38	36167	30	863528.12	35923	30
20	99323.836	563	855554.68	35987	30	861379.01	35744	30
19	99320.455	564	853401.72	35828	30	859240.65	35565	30
18	99317.065	566	851259.43	35631	29	857112.95	35588	29
17	99313.667	567	849127.22	35455	29	854995.84	35212	29
16	99310.260	568	847006.51	35281	29	852889.23	35038	29
15	99306.846	570	844895.73	35108	29	850793.04	34864	29
14	99303.422	571	842795.30	34936	29	848707.21	34692	29
13	99299.991	573	840705.15	34765	28	846631.65	34522	28
12	99296.551	574	836655.19	34595	28	844566.29	34352	28
11	99293.102	575	836555.36	34427	28	842511.05	34184	28
10	99289.646	577	834495.57	34260	28	840465.86	34017	28
9	99286.186	578	832445.77	34095	28	838430.65	33851	28
8	99282.707	580	830405.86	33930	27	836405.34	33687	27
7	99279.225	581	828375.79	33767	27	834389.86	33533	27
6	99275.734	682	826355.47	33604	27	832384 15	33362	27
5	99272.235	584	824344.85	33444	27	830388.12	33200	27
4	99268.728	585	822343.84	33284	27	828401.71	33040	27
3	99265.212	587	820352.39	33125	26	826424.85	32882	26
2	99261.688	588	818370.41	32967	26	824457.48	32724	26
1	99258.156	589	816397.85	32811	26	822490.52	32568	26
0	99254.615	591	814434.64	32656	26	820550.90	32412	26

1 2

7. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	12215.81	481	12307.98	492	100754.585	601
2	12244.68	481	12337.51	492	100758.197	603
3	12273.55	481	12367.05	492	100761.817	604
4	12302.41	481	12396.58	492	100765.447	606
5	12331.28	481	12426.12	492	100769.085	607
6	12360.15	481	12455.66	492	100772.732	609
7	12389.01	481	12485.20	492	100776.387	610
8	12417.88	481	12514.74	492	100780.052	612
9	12446.74	481	12544.29	492	100783.725	613
10	12475.60	481	13573.84	492	100787.407	614
11	12504.46	481	12603.39	493	100791.097	616
12	12533.32	481	12632.94	493	100794.797	617
13	12562.18	481	12662.49	493	100798.505	619
14	12591.04	481	12692.05	493	100802.223	620
15	12619.90	481	12721.61	493	100805.949	622
16	12648.75	481	12751.17	493	100809.683	623
17	12677.61	481	12780.73	493	100813.427	625
18	12706.46	481	12810.29	493	100817.179	626
19	12735.31	481	12839.86	493	100820.941	628
20	12764.16	481	12869.43	493	100824.711	629
21	12793.01	481	12899.00	493	100828.490	631
22	12821.86	481	12928.58	493	100832.277	632
23	12850.71	481	12958.15	493	100836.074	634
24	12879.56	481	12987.73	493	100839.878	635
25	12908.41	481	13017.31	493	100843.693	637
26	12937.25	481	13046.90	493	100847.516	638
27	12966.09	481	13076.48	493	100851.348	639
28	12994.94	481	13106.07	493	100855.188	641
29	13023.78	481	13135.66	493	100859.038	642
30	13052.62	481	13165.25	493	100862.896	644

82. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
59	99251.066	592	812480.71	32501	26	818611.57	32258	26
58	99247.508	594	810535.99	32348	25	816681.45	32105	25
57	99243.942	595	808600.42	32196	25	814760.48	31953	25
56	99240.368	596	806673.94	32045	25	812848.60	31802	25
55	99236.785	598	804756.47	31895	25	810945.73	31652	25
54	99233.194	599	802847.96	31747	25	809051.82	31503	25
53	99229.594	601	800948.35	31599	25	807166.81	31355	25
52	99225.986	602	799057.56	31452	24	805290.62	31209	24
51	99222.370	603	797175.55	31306	24	803423.21	31063	24
50	99218.745	605	795302.24	31162	24	801564.50	30918	24
49	99215.112	606	793437.58	31018	24	799714.45	30774	24
48	99211.470	608	791581.51	30875	24	797872.98	30631	24
47	99207.820	609	789733.96	30733	24	796040.03	30490	24
46	99204.162	610	787894.89	30593	23	794215.56	30349	23
45	99200.495	612	786064.23	30453	23	792399.50	30201	23
44	99196.820	613	784241.91	30314	23	790591.29	30070	23
43	99193.136	615	782427.90	30176	23	788792.38	29933	23
42	99189.444	616	780622:12	30039	23	787001.20	29796	23
41	99185.744	618	778824.53	29903	23	785218.21	29660	23
40	99182.035	619	777035.06	29768	22	783443.35	29525	22
39	99178.318	620	775253.66	29634	22	781676.55	29091	22
38	99174.592	621	773480.28	29501	22	779917.78	29257	22
37	99170.859	623	771714.86	29369	22	778166.69	29125	22
36	99167.116	624	769957.35	29237	22	776424.06	28994	22
35	99163.366	626	768207.69	29107	22	774689.01	28863	22
34	99159.606	627	766465.84	28977	21	772966.76	28734	21
33	99155.829	628	764731.74	28848	21	771242.26	28605	21
32	99152.053	630	763005.33	28720	21	769530.47	28577	21
31	99148.279	631	761286.57	28593	21	767826.31	28350	21
30	99144.486	633	759575.41	28467	21	766129.76	28223	21

7.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	13081.46	481	13194.84	493	100866.763	645
32	13110.30	481	13224.44	493	100870.639	647
33	13139.13	481	13254.04	493	100874.524	648
34	13167.97	481	13283.64	493	100878.417	650
35	13196.80	481	13313.24	493	100882.320	651
36	13225.64	481	13342.45	493	100886.231	653
37	13254.47	481	13372.46	493	100890.151	654
38	13283.30	481	13402.07	494	100894.080	656
39	13312.13	480	13431.68	494	100898.018	657
40	13340.96	480	13461.29	494	100901.964	659
41	13369.79	480	13490.91	494	100905.920	660
42	13398.62	480	13520.53	494	100909.884	662
43	13427.44	480	13550.15	494	100913.857	663
44	13456.27	480	13579.78	494	100917.839	665
45	13485.09	480	13609.40	494	100921.830	666
46	13513.92	480	13639.03	494	100925.830	667
47	13542.74	480	13668.66	494	100929.839	669
48	13571.56	480	13698.30	494	100933.856	670
49	13600.38	480	13727.93	494	100937.882	672
50	13629.19	480	13757.57	494	100941.918	673
51	13658.01	480	13787.21	494	100945.962	675
52	13686.83	480	13816.85	494	100950.015	676
53	13715.64	480	13846.50	494	100954.076	678
54	13744.45	480	13876.15	494	100958.187	679
55	13773.27	480	13905.80	494	100962.227	681
56	13802.08	480	13935.45	494	100966.315	682
57	13830.89	480	13965.10	494	100970.412	684
58	13859.70	480	13994.76	494	100974.518	685
59	13888.50	480	14024.42	494	100978.633	687
60	13917.31	480	14054.08	494	100982.757	688

82.Grad.

Prima	Sinus	10″	Tangens	10″	Inc.	Secans	10′	Inc.
29	99140.685	634	757871.79	28341	21	764440.75	28098	21
28	99136.876	635	756175.67	28217	21	762759.23	27973	21
27	99133.058	637	754486 99	28093	21	761085.16	27850	21
26	99129.232	638	752805.71	27970	20	759418.48	27727	20
25	99125.397	640	751131.77	27848	20	757759.16	27605	20
24	99121.554	641	749465.14	27727	20	756107.13	27483	20
23	99117.703	642	747805.75	27606	20	754462.36	27363	20
22	99113.843	644	746153.57	27486	20	752824.78	27243	20
21	99109.975	645	744508.55	27368	20	751194.37	27124	20
20	99106.098	647	742870.63	27249	10	749571.06	27006	20
19	99102.213	648	741239.78	27132	19	747954.82	26889	19
18	99098.320	649	739615.95	27015	19	746345.60	26772	19
17	99094.418	651	737999.09	26899	19	744743.35	26656	19
16	99090.508	652	736389.15	26784	19	743148.03	26541	19
15	99086.590	654	734786.10	26670	19	741559.58	26426	19
14	99082.665	655	733189.89	26556	19	739978.02	26312	19
13	99078.728	656	731600.47	26443	19	738403.18	26100	19
12	99074.784	658	730017.80	26331	19	736835.12	26088	19
11	99070.832	659	728441.84	26220	19	735273.77	25970	19
10	99066.872	661	726872.54	26109	18	733719.09	25865	18
9	99062.903	662	725309.87	25900	18	732171.02	25557	18
8	99058.926	663	723753.78	25889	18	730629.54	25646	18
7	99054.940	665	722204.22	25781	18	729094.60	25537	18
6	99050.946	666	720661.16	25672	18	727566.16	25429	18
5	99046.944	668	719124.56	25565	18	726044.17	25322	18
4	99042.933	669	717594.37	25459	18	724528.59	25215	18
3	99038.914	670	716070.56	25353	18	723019.39	25109	18
2	99034.887	672	714553.08	25247	18	721516.53	25004	18
1	99030.851	673	713041.90	25143	17	720019.96	24899	17
0	99026.807	675	711536.97	25039	17	718529.65	24795	17

8. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	13946.11	480	14083.75	494	100986.890	690
2	13974.92	480	14113.41	494	100991.032	691
3	14003.72	480	14143.08	495	100995.182	693
4	14032.52	480	14172.76	495	100999.341	694
5	14061.32	480	14202.43	495	101003.510	696
6	14090.12	480	14232.11	495	101007.687	697
7	14118.92	480	14261.79	495	101011.873	699
8	14147.72	480	14291.47	495	101016.068	700
9	14176.51	480	14321.15	495	101020.272	702
10	14205.31	480	14350.84	495	101024.485	703
11	14234.10	480	14380.53	495	101028.707	704
12	14262.89	480	14410.22	495	101032.938	706
13	14291.68	480	14439.91	495	101037.177	707
14	14320.47	480	14469.61	495	101041.452	709
15	14349.26	480	14499.31	495	101045.683	710
16	14378.05	480	14529.01	495	101049.949	712
17	14406.83	480	14558.72	495	101054.224	713
18	14435.62	480	14588.42	495	101058.508	715
19	14464.40	480	14618.13	495	101062.801	716
20	14493.19	480	14647.84	495	101067.103	718
21	14521.97	480	14677.56	495	101071.414	719
22	14550.75	480	14707.27	495	101075.733	721
23	14579.52	480	14736.99	495	101080.062	722
24	14608.30	480	14766.71	495	101084.400	724
25	14637.08	480	14796.44	495	101088.746	725
26	14665.85	480	14826.17	495	101093.102	727
27	14694.63	480	14855.90	496	101097.466	728
28	14723.40	479	14885.63	496	101101.839	730
29	14752.17	479	14915.36	496	101106.226	731
30	14780.94	479	14945.10	496	101110.613	733

81.Grad.

Prima	Sinus	10"	Tangens	10"	Inc	Secans	10"	Inc
59	99022.754	676	710038.26	24935	17	717045.56	24692	17
58	99018.693	677	708545.73	24833	17	715567.64	24589	17
57	99014.624	679	707059.34	24731	17	714095.87	24487	17
56	99010.546	680	705579.05	24629	17	712630.19	24386	17
55	99006.460	682	704104.82	24528	17	711170.58	24285	17
54	99002.366	683	702636.62	24428	17	709717.00	24185	17
53	98998.263	684	701174.41	24329	17	708269.41	24095	17
52	98994.162	686	699718.05	24230	16	706827.77	23986	16
5[illegible]	98990.032	687	698267.81	241[illegible]	16	705392.05	23888	16
50	98985.904	689	696823.35	24034	16	703962.20	23790	16
49	98981.768	690	695384.73	23937	16	702538.20	23693	16
48	98977.623	691	693951.92	23840	16	701120.01	23596	16
47	98973.470	693	692524.89	23744	16	699707.60	23500	16
46	98969.309	694	691103.59	23649	16	698300.92	23405	16
45	98965.139	696	689687.99	23554	16	696899.94	23310	16
44	98960.960	697	688228.07	23460	16	695504.64	23216	16
43	98956.774	698	686873.77	23367	16	694114.96	23122	16
42	98952.579	600	685675.08	23273	15	692730.89	23029	15
41	98948.376	701	684081.96	23180	15	691352.39	22937	15
40	98944.164	703	682694.37	23088	15	689979.42	22845	15
39	98939.944	704	681312.27	22997	15	688611.95	22753	15
38	98935.715	705	679935.65	22906	15	687249.95	22662	15
37	98931.478	707	678564.46	22815	15	685893.38	22572	15
36	98927.233	708	677188.67	22726	15	684542.21	22482	15
35	98922.980	710	675838.26	22636	15	683196.42	22393	15
34	98918.718	711	674483.18	22548	15	681855.97	22304	15
33	98914.447	712	973133.41	22459	15	680520.82	22211	15
32	98910.169	714	671788.91	22372	15	679190.95	22128	15
31	98905.882	715	670449.66	22285	14	677866.32	22041	14
30	98901.586	716	669115.62	22120	14	676546.91	21954	14

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8. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	14809.71	479	14974.84	496	101115.013	734
32	14838.48	479	14004.58	496	101119.422	736
33	14867.24	479	15034.33	496	101123.840	737
34	14896.01	479	15064.07	496	101128.267	739
35	14924.77	479	15093.82	496	101132.703	740
36	14953.53	479	15123.58	496	101137.148	742
37	14982.30	479	15153.33	496	101141.601	743
38	15011.05	479	15183.09	496	101146.064	745
39	15039.81	479	15212.85	496	101150.536	746
40	15068.57	479	15242.62	496	101155.016	748
41	15097.33	479	15272.38	496	101159.506	749
42	15126.08	479	15302.15	496	101164.004	751
43	15154.83	479	15331.92	496	101168.512	752
44	15183.59	479	15361.69	496	101173.028	754
45	15212.34	479	15391.47	496	101177.554	755
46	15241.09	479	15421.25	496	101182.088	757
47	15269.84	479	15451.03	496	101186.632	758
48	15298.58	479	15480.82	496	101191.184	760
49	15327.33	479	15510.60	496	101195.745	761
50	15356.07	479	15540.39	497	101200.316	763
51	15384.82	479	15570.19	497	101204.895	764
52	15413.56	479	15599.98	497	101209.483	766
53	15442.30	479	15629.78	497	101214.080	767
54	15471.04	479	15659.58	497	101218.687	769
55	15499.78	479	15689.39	497	101223.302	770
56	15528.51	479	15719.19	497	101227.926	772
57	15557.25	479	15749.00	497	101232.559	773
58	15585.98	479	15778.81	497	101237.201	775
59	15614.71	479	15808.63	497	101241.852	776
60	15643.45	479	15838.44	497	101246.513	775

81. Grad.

Prima	Sinus	10"	Tangens	10"	Inc	Secans	10"	Inc
29	98897.283	718	667786.77	22112	14	675232.68	21868	14
28	98892.970	719	666463.07	22027	14	673923.60	21782	14
27	98888.650	721	665144.49	21941	14	672619.65	21697	14
26	98884.321	722	665831.00	21856	14	671320.79	21612	14
25	98879.984	723	662522.58	21772	14	670026.99	21528	14
24	98875.638	725	661219.19	21688	14	668738.22	21445	14
23	98871.284	726	659920.80	21605	14	667454.46	21362	14
22	98866.922	728	658627.39	21522	14	666175.68	21279	14
21	98862.551	729	657338.92	21440	14	664901.84	21196	14
20	98858.172	731	656055.38	21365	14	663632.92	21115	14
19	98853.784	732	654776.12	21277	14	662368.90	21033	14
18	98849.389	733	653502.93	21196	13	661109.73	20952	13
17	98844.984	735	652233.96	21116	13	659855.40	20872	13
16	98840.572	736	650969.81	21036	13	658605.87	20782	13
15	98836.151	737	649710.43	20957	13	657361.12	20713	13
14	98831.722	739	648455.81	20878	13	656121.13	20634	13
13	98827.284	740	647205.91	20799	13	654885.86	20555	13
12	98822.838	742	645960.70	20721	13	653655.28	20477	13
11	98818.384	743	644720.17	20643	13	652429.38	20399	13
10	98813.921	744	643484.28	20566	13	651208.12	20322	13
9	98809.450	746	642253.01	20489	13	649991.48	20245	13
8	98804.971	747	641026.33	20413	13	648779.43	20169	13
7	98800.483	749	639804.22	20337	13	647571.95	20093	13
6	98795.997	750	638586.64	20261	13	646369.01	20018	13
5	98791.482	751	637373.59	20186	12	645170.59	19942	12
4	98786.969	753	636165.02	20112	12	643976.66	19868	12
3	98782.448	754	634960.92	20037	12	642787.19	19794	12
2	98777.918	756	633761.26	19964	12	642787.16	19720	12
1	98773.380	757	632566.01	19890	12	640421.54	19646	12
0	98768.834	758	631375.15	19817	12	639245.32	19573	12

9.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	15672.18	479	15868.26	497	101251.182	779
2	15700.90	479	15898.09	497	101255.860	781
3	15729.63	479	15927.91	497	101260.547	782
4	15758.36	479	15957.74	497	101265.243	784
5	15787.08	479	15987.57	497	101269.948	785
6	15815.81	479	16017.40	497	101274.662	787
7	15844.53	479	16047.24	497	101289.386	788
8	15873.25	479	16077.08	497	101284.118	790
9	15901.97	479	16106.92	497	101288.859	791
10	15930.69	479	16136.77	497	101293.609	793
11	15959.40	479	16166.61	497	101298.368	794
12	15988.12	479	16196.47	498	101303.137	796
13	16016.83	479	16226.32	498	101307.914	797
14	16045.54	479	16256.17	498	101312.700	799
15	16074.26	478	16286.03	498	101317.496	800
16	16102.97	478	16315.90	498	101322.300	802
17	16131.67	478	16345.76	498	101327.113	803
18	16160.38	478	16375.63	498	101331.936	805
19	16189.09	478	16405.50	498	101336.767	806
20	16217.79	478	16435.37	498	101341.608	808
21	16246.49	478	16465.25	498	101346.457	809
22	16275.20	478	16495.13	498	101351.316	811
23	16303.90	478	16525.01	498	101356.183	812
24	16332.60	478	16554.89	498	101361.060	814
25	16361.29	478	16584.78	498	101365.946	815
26	16389.99	478	16614.67	498	101370.840	817
27	16418.68	478	16644.56	498	101375.744	818
28	16447.38	478	16674.46	498	101380.657	820
29	16476.07	478	16704.36	498	101385.579	821
30	16504.76	478	16734.26	498	101390.510	823

80.Grad.

Prima	Sinus	10″	Tangens	10″	Inc	Secans	10″	Inc
59	98764.279	760	630188.66	19745	12	638073.47	19501	12
58	98759.716	761	629006.51	19672	12	636905.95	19428	12
57	98755.145	762	627828.68	19601	12	635742.76	19357	12
56	98750.565	764	626655.14	19529	12	634583.86	19285	12
55	98745.977	765	625485.88	19458	12	633429.23	19214	12
54	98741.381	767	624320.86	19388	12	632278.84	19144	12
53	98736.776	768	623160.07	19317	12	631132.69	19073	12
52	98732.163	769	622003.47	19247	12	629990.73	19094	12
51	98727.541	771	620851.06	19178	12	628852.95	18934	12
50	98722.911	772	619702.79	19109	11	627719.33	18865	11
49	98718.273	774	618558.66	19040	11	626589.84	18796	11
48	98713.626	775	617418.65	18972	11	625464.45	18728	10
47	98708.972	777	616282.71	18904	11	624343.16	18660	11
46	98704.308	778	615150.85	18836	11	623225.94	18592	11
45	98699.637	779	614023.03	18769	11	622112.75	18525	11
44	98694.957	781	612899.23	18702	11	621003.59	18458	11
43	98690.268	782	611779.42	18636	11	619898.43	18392	11
42	98685.572	783	610663.60	18569	11	618792.25	18325	11
41	98680.867	785	609551.74	18504	11	617700.02	18260	11
40	98676.153	786	608443.81	18438	11	616606.74	18194	11
39	98671.431	788	607339.79	18373	11	615517.36	18129	11
38	98666.701	789	606239.67	18308	11	614431.89	18064	11
37	98661.963	790	605143.43	18244	11	613350.28	17900	11
36	98657.216	792	604051.03	18180	11	612272.53	17936	11
35	98652.461	793	602962.47	18116	11	611198.61	17872	11
34	98647.698	794	601877.72	18053	11	610128.50	17809	11
33	98642.926	796	600796.76	17990	10	609062.19	17746	10
32	98638.146	797	599719.57	17927	10	607999.64	17683	10
31	98633.357	799	598646.14	17865	10	606940.85	17621	10
30	98628.560	800	597576.44	17803	10	605885.80	17558	10

9.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	16533.45	478	16764.17	498	101395.450	824
32	16562.14	478	16794.07	498	101400.400	826
33	16590.82	478	16823.98	499	101405.357	827
34	16619.51	478	16853.90	499	101410.324	829
35	16648.19	478	16883.81	499	101415.301	830
36	16676.87	478	16913.73	499	101420.285	832
37	16705.55	478	16943.66	499	101425.280	833
38	16734.23	478	16973.58	499	101430.284	835
39	16762.91	478	17003.51	499	101435.296	836
40	16791.59	478	17033.44	499	101440.318	838
41	16820.26	478	17063.38	499	101445.349	839
42	16848.94	478	17093.31	499	101450.389	841
43	16877.61	478	17123.25	499	101455.438	842
44	16906.28	478	17153.20	499	101460.495	844
45	16934.95	478	17183.14	499	101465.563	845
46	16963.62	478	17213.09	499	101470.639	847
47	16992.28	478	17243.04	499	101475.724	848
48	17020.95	478	17273.00	499	101480.818	850
49	17049.61	478	17302.96	499	101485.922	851
50	17078.28	478	17332.92	499	101491.034	853
51	17106.94	478	17362.88	499	101496.156	854
52	17135.60	478	17392.85	499	101501.287	856
53	17164.25	478	17422.82	500	101506.427	868
54	17192.91	478	17452.79	500	101511.576	859
55	17221.56	478	17482.77	500	101516.733	861
56	17250.22	478	17512.75	500	101521.901	862
57	17278.87	478	17542.73	500	101527.077	864
58	17307.22	477	17572.72	500	101532.263	865
59	17336.17	477	17602.71	500	101537.457	867
60	17364.82	477	17632.70	500	101542.661	868

80.Grad.

Prima	Sinus	10″	Tangens	10″	In.	Secans	10″	Inc.
29	98623.755	801	596510.45	17741	10	604834.45	17497	10
28	98618.941	803	595448.15	17679	10	603786.80	17435	10
27	98614.119	804	594389.52	17618	10	602742.82	17374	10
26	98609.289	806	593334.55	17558	10	601702.50	17313	10
25	98604.451	807	592283.22	17497	10	600665.81	17253	10
24	98599.604	808	591235.50	17437	10	599632.74	17193	10
23	98594.748	810	590191.38	17377	10	598603.26	17133	10
22	98589.885	811	589150.84	17318	10	597577.37	17073	10
21	98585.013	813	588113.86	17258	10	596555.04	17014	10
20	98580.133	814	587080.42	17199	10	595536.25	16955	10
19	98575.244	815	586050.50	17141	10	594520.98	16897	10
18	98570.347	817	585024.09	17183	10	593509.22	16838	10
17	98565.442	818	584001.17	17025	10	592500.95	16780	10
16	98560.528	820	582981.72	16967	10	591496.14	16723	10
15	98555.606	821	581965.72	16909	10	590494.79	16665	10
14	98550.676	822	580953.15	16852	9	589496.87	16608	9
13	98545.737	824	579944.00	16796	9	588502.37	16551	9
12	98540.790	825	578938.25	16739	9	587511.28	16495	9
11	98535.834	826	577935.88	16683	9	586523.56	16439	9
10	98530.871	828	576936.88	16627	9	585539.20	16383	9
9	98525.899	829	575941.22	16571	9	584558.20	16327	9
8	98520.918	831	574948.89	16516	9	583580.53	16272	9
7	98515.930	832	573959.88	16461	9	582606.17	16216	9
6	98510.933	833	572974.16	16406	9	581635.10	16162	9
5	98505.927	835	571991.73	16351	9	580667.32	16107	9
4	98500.913	836	571012.56	16297	9	579702.80	16053	9
3	98495.891	838	570036.63	16243	9	578741.53	15999	9
2	98490.961	839	569063.94	16189	9	577783.49	15945	9
1	98485.822	840	568094.46	16135	9	576828.67	15891	9
0	98480.775	842	567128.18	16083	9	575877.05	15838	9

10.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	17393.46	477	17662.69	500	101547.874	870
2	17422.11	477	17692.69	500	101553.096	871
3	17450.75	477	17722.69	500	101558.327	873
4	17479.39	477	17752.70	500	101563.567	874
5	17508.03	477	17782.70	500	101568.818	876
6	17536.67	477	17812.71	500	101574.075	877
7	17565.31	477	17842.73	500	101579.343	879
8	17593.95	477	17872.74	500	101584.620	880
9	17622.58	477	17902.76	500	101589.905	882
10	17651.21	477	17932.78	500	101595.201	883
11	17679.84	477	17962.81	500	101600.505	885
12	17708.47	477	17992.84	500	101605.818	886
13	17737.10	477	18022.87	500	101611.141	888
14	17765.73	477	18052.91	500	101616.472	889
15	17794.35	477	18082.95	500	101621.813	891
16	17822.98	477	18112.99	500	101627.163	893
17	17851.60	477	18143.03	500	101632.522	894
18	17880.22	477	18173.08	500	101637.891	896
19	17908.84	477	18203.13	500	101643.268	897
20	17937.46	477	18233.18	500	101648.655	899
21	17966.07	477	18263.24	500	101654.051	900
22	17994.69	477	18293.30	501	101659.456	902
23	18023.30	477	18323.37	501	101664.870	903
24	18051.91	477	18353.43	501	101670.293	905
25	18080.52	477	18383.50	501	101675.726	906
26	18109.13	477	18413.58	501	101681.168	908
27	18137.74	477	18443.65	501	101686.619	909
28	18166.35	477	18473.73	501	101692.079	911
29	18194.95	477	18503.82	501	101697.548	912
30	18223.55	477	18533.90	501	101703.027	914

79.Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
59	98475.720	843	566165.08	16030	9	574928.61	15785	9
58	98470.656	845	565205.16	15977	9	573983.33	15733	9
57	98465.584	846	564248.38	15424	9	573041.21	15680	9
56	98460.504	847	563294.73	15872	9	572102.23	15628	9
55	98455.405	849	562344.22	15820	9	571166.36	15576	9
54	98450.318	850	561396.79	15769	9	570233.60	15525	9
53	98445.213	851	560452.47	15717	9	569303.93	15473	9
52	98440.099	853	559511.21	15666	8	568377.34	15422	8
51	98434.977	854	558573.02	15615	8	567453.80	15371	8
50	98429.846	856	557637.86	15566	8	566533.31	15320	8
49	98424.708	857	556705.74	15514	8	565615.84	15270	8
48	98419.561	858	555776.63	15464	8	564701.39	15220	8
47	98414.405	860	554850.52	15414	8	563789.95	15170	8
46	98409.242	861	553927.40	15365	8	562881.48	15120	8
45	98404.070	863	553007.24	15315	8	561975.99	15170	8
44	98398.889	864	552090.04	15266	8	561073.45	15022	8
43	98393.701	865	551175.79	15217	8	560173.86	14973	8
42	98388.504	867	550264.46	15169	8	559277.16	14924	8
41	98383.298	868	549356.04	15120	8	558383.43	14876	8
40	98378.085	870	548450.52	15672	8	557492.58	14828	8
39	98372.863	871	547547.88	15024	8	556604.60	14780	8
38	98367.633	872	546648.12	14976	8	555719.50	14732	8
37	98362.394	874	545751.21	14929	8	554837.26	14684	8
36	98357.147	875	544857.15	14881	8	553957.86	14637	8
35	98351.892	876	543966.92	14834	8	553081.29	14590	8
34	98346.628	878	543077.50	14787	8	552207.54	14543	8
33	98341.356	879	542191.88	14741	8	551336.59	14496	8
32	98336.076	881	541309.06	14694	8	550468.43	14450	8
31	98330.788	882	540429.00	14648	8	549603.05	14404	8
30	98325.491	883	539551.72	14602	8	548740.47	14358	8

10. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	18252.15	477	18563.99	502	101708.514	962
32	18280.75	477	18594.09	502	101714.011	963
33	18309.35	477	18624.18	502	101719.517	965
34	18337.95	477	18654.28	502	101725.033	966
35	18366.54	477	18684.38	502	101730.557	968
36	18395.13	477	18714.49	502	101736.091	969
37	18423.73	476	18744.60	502	101741.634	971
38	18452.32	476	18774.71	502	101747.186	973
39	18480.90	476	18804.83	502	101752.747	974
40	18509.49	476	18834.95	502	101758.318	976
41	18538.08	476	18865.67	502	101763.898	977
42	18566.66	476	18895.20	502	101769.487	979
43	18595.24	476	18925.32	502	101775.085	980
44	18623.82	476	18955.46	502	101780.693	982
45	18652.40	476	18985.59	502	101786.309	983
46	18680.98	476	19015.73	502	101791.935	984
47	18709.56	476	19045.87	502	101797.570	986
48	18738.13	476	19076.02	503	101803.215	988
49	18766.70	476	19106.17	503	101808.868	990
50	18795.27	476	19136.32	503	101814.531	991
51	18823.84	476	19166.48	503	101820.204	993
52	18852.41	476	19196.64	503	101825.885	994
53	18880.98	476	19226.80	503	101831.575	996
54	18909.54	476	19256.96	503	101837.276	997
55	18938.11	476	19287.13	503	101842.985	999
56	18966.67	476	19317.31	503	101848.703	1000
57	18995.23	476	19347.48	503	101854.431	1002
58	19023.79	476	19377.66	503	101860.168	1004
59	19052.34	476	19407.84	503	101865.914	1005
60	19080.90	476	19438.03	503	101871.669	1007

79. Grad.

Prima	Sinus	10''	Tangens	10''	In	Secans	10''	In
29	98320.186	885	538677.18	14557	8	547880.55	14312	8
28	98314.872	886	537805.38	14551	8	547023.42	14269	8
27	98309.550	888	536936.30	14466	8	546169.01	14221	8
26	98304.220	889	536069.93	14421	8	545317.31	14176	8
25	98298.882	890	535206.26	14377	7	544468.31	14131	7
24	98293.535	892	534345.27	14331	7	543621.99	14089	7
23	98288.180	893	533486.96	14287	7	542778.35	14042	7
22	98282.816	894	532631.31	14242	7	541937.37	13998	7
21	98277.445	896	531778.30	14198	7	541099.03	13954	7
20	98272.065	897	530927.93	14155	7	540263.33	13910	7
19	98266.676	899	530080.18	14111	7	539430.26	13866	7
18	98261.280	900	529235.04	14068	7	538599.79	13823	7
17	98255.875	901	528392.51	14024	7	537771.92	13780	7
16	98250.461	903	527552.55	13981	7	536946.64	13737	7
15	98245.040	904	526715.17	13939	7	536123.93	13694	7
14	98239.610	905	525880.35	13896	7	535303.79	13651	7
13	98234.172	907	525048.09	13853	7	534486.20	13609	7
12	98228.725	908	524218.36	13811	7	533671.14	13567	7
11	98223.270	910	523391.10	13769	7	532858.61	13525	7
10	98217.807	911	522566.47	13727	7	532048.60	13483	7
9	98212.336	912	521744.28	13686	7	531241.09	13441	7
8	98206.856	914	520924.59	13644	7	530436.08	13370	7
7	98201.368	915	520107.38	13603	7	529633.54	13359	7
6	98195.871	917	519292.64	13562	7	528833.47	13317	7
5	98190.367	918	518480.35	13521	7	528035.87	13276	7
4	98184.854	919	517670.51	13480	7	527240.70	13236	7
3	98179.332	921	516863.11	13440	7	526447.98	13196	7
2	98173.803	922	516058.13	13399	7	525657.68	13156	7
1	98168.265	924	515255.56	13359	7	524869.79	13115	7
0	98152.718	925	514455.40	13319	7	524084.31	13075	7

11. Grad.

Prima	Sinus	10''	Tangens	10''	Secans	10''
1	19109.45	476	19468.22	503	101877.434	962
2	19138.00	476	19498.41	503	101883.208	963
3	19166.55	476	19528.61	503	101888.991	965
4	19195.10	476	19558.81	503	101894.784	966
5	19223.65	476	19589.01	503	101900.586	968
6	19252.20	476	19619.22	503	101906.397	969
7	19280.74	476	19649.43	504	101912.217	971
8	19309.28	476	19679.64	504	101918.047	973
9	19337.82	476	19709.86	504	101923.886	974
10	19366.36	476	19740.08	504	101929.755	976
11	19394.90	476	19770.31	504	101935.592	977
12	19423.43	476	19800.53	504	101941.459	979
13	19451.97	476	19830.76	504	101947.335	980
14	19480.50	476	19861.00	504	101953.221	982
15	19509.03	475	19891.24	504	101959.126	983
16	19537.56	475	19921.48	504	101965.020	984
17	19566.09	475	19951.72	504	101970.933	986
18	19594.61	475	19981.97	504	101976.856	988
19	19623.14	475	20012.22	504	101982.788	990
20	19651.66	475	20042.48	504	101988.730	991
21	19680.18	475	20072.74	504	101994.680	993
22	19708.70	475	20103.00	504	102000.640	994
23	19737.22	475	20133.27	504	102006.610	996
24	19765.73	475	20163.54	505	102012.589	997
25	19794.25	475	20183.81	505	102018.577	999
26	19822.76	475	20224.09	505	102024.574	1000
27	19851.27	475	20254.37	505	102030.581	1002
28	19879.78	475	20284.65	505	102036.597	1004
29	19908.29	475	20314.94	505	102042.622	1005
30	19936.76	475	20345.23	505	101048.657	1007

78. Grad.

Prima	Sinus	10″	Tangens	10″	In	Secans	10″	In
59	98157.164	926	513657.63	13280	7	523301.21	13035	7
58	98151.601	928	512862.24	13240	7	522520.50	12995	7
57	98146.030	929	512069.21	13201	7	521742.16	12956	7
56	98140.450	930	511278.55	13161	7	520966.18	12917	7
55	98134.862	932	510490.24	13122	7	520192.54	12878	7
54	98129.266	933	509704.26	13083	6	519421.25	12839	6
53	98123.662	935	508920.61	13045	6	518652.28	12800	6
52	98118.049	936	508139.28	13006	6	517885.63	12761	6
51	98112.428	937	507360.25	12968	6	517121.28	12723	6
50	98106.799	939	506583.52	12930	6	516359.24	12685	6
49	98101.161	940	505809.07	12892	6	515599.48	12647	6
48	98095.516	942	595036.90	12854	6	514841.99	12609	6
47	98089.861	943	504267.00	12816	6	514086.77	12571	6
46	98081.199	944	503400.35	12779	6	513333.81	12534	6
45	98078.528	946	509733.95	12741	6	512583.09	12496	6
44	98072.849	947	501970.78	12704	6	511834.61	12459	6
43	98067.162	948	501209.84	12667	6	511088.35	12422	6
42	98061.466	950	500451.11	12630	6	510344.31	12385	6
41	98055.762	951	499694.59	12593	6	509602.48	12349	6
40	98050.050	953	498940.27	12557	6	508862.84	12312	6
39	98044.329	954	498188.13	12520	6	508125.39	12276	6
38	98038.600	955	497438.17	12484	6	507390.12	12239	6
37	98032.863	957	499690.37	12448	6	506657.01	12203	6
36	98027.117	958	495944.74	12412	6	505926.06	12168	6
35	98021.364	960	495201.25	12377	6	505197.26	12132	6
34	98015.602	961	494459.90	12341	6	504470.60	12096	6
33	98009.831	962	493720.68	12306	6	503746.07	12061	6
32	98004.053	964	492983.58	12270	6	503023.67	12025	6
31	97998.266	965	492248.59	12235	6	502303.37	11990	6
30	97992.470	967	491515.70	12200	6	501585.17	11955	6

11. Grad.

Prima	Sinus	10″	Targens	10″	Secant	10″
31	19965.30	475	20375.52	505	102054.701	1008
32	19993.80	475	20405.82	505	102060.754	1010
33	20022.30	475	20436.12	505	102066.817	1011
34	20050.80	475	20466.43	505	102072.889	1013
35	20079.30	475	20496.74	505	102078.971	1014
36	20107.79	475	20527.05	505	102085.062	1016
37	20136.29	475	20557.37	505	102091.162	1018
38	20164.78	475	20587.69	505	102097.272	1019
39	20193.27	475	20618.02	505	102103.391	1021
40	20221.76	475	20648.34	505	102109.520	1022
41	20250.24	475	20678.67	505	102115.657	1024
42	20278.73	475	20709.00	506	102121.804	1025
43	20307.21	475	20739.34	506	102127.961	1027
44	20335.69	475	20769.68	506	102134.126	1029
45	20364.17	475	20800.03	506	102140.302	1030
46	20392.65	475	20830.38	506	102146.486	1032
47	20421.13	475	20860.73	506	102152.681	1033
48	20449.60	475	20891.09	506	102158.884	1035
49	20478.08	474	20921.45	506	102165.097	1036
50	20506.55	474	20951.81	506	102171.319	1038
51	20535.02	474	20982.18	506	102177.551	1040
52	20563.49	474	21012.55	506	102183.792	1041
53	20591.95	474	21042.93	506	102190.042	1043
54	20620.42	474	21073.30	506	102196.302	1044
55	20648.88	474	21103.69	506	102202.572	1046
56	20677.34	474	21134.07	506	102208.850	1047
57	20705.80	474	21164.46	507	102215.138	1049
58	20734.26	474	21194.86	507	102221.436	1051
59	20762.71	474	21225.25	507	102227.743	1052
60	20791.17	474	21255.66	507	102234.059	1054

78.Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	97986.667	968	490784.91	12166	6	500869.07	11921	6
28	97980.855	969	490056.20	12131	6	500155.05	11886	6
27	97975.035	971	489329.56	12096	6	499443.11	11851	6
26	97969.207	972	488604.99	12062	6	498733.23	11817	6
25	97963.370	673	487882.48	12028	6	498025.41	11783	6
24	97957.525	975	487162.01	11994	6	497319.64	11749	6
23	97951.672	976	486443.59	11960	6	496615.91	11717	6
22	97945.810	977	485727.19	11936	6	495914.21	11681	6
21	97939.940	979	485012.82	11892	6	495214.53	11651	6
20	97934.062	980	484300.45	11859	6	494516.86	11614	6
19	97928.176	982	483590.10	11825	6	493821.20	11581	6
18	97922.281	983	482881.73	11792	5	493127.54	11547	5
17	97916.378	984	482175.36	11759	5	492435.86	11514	5
16	97910.467	986	481470.96	11726	5	491746.16	11481	5
15	97904.547	987	480768.54	11693	5	491058.44	11448	5
14	97898.619	989	480068.08	11661	5	490372.67	11416	5
13	97892.683	990	479369.57	11628	5	489688.86	11383	5
12	97886.739	991	478673.00	11596	5	489007.00	11351	5
11	97880.786	993	477978.37	11564	5	488327.07	11319	5
10	97874.825	994	477285.67	11932	5	487649.07	11287	5
9	97868.856	995	476594.90	11400	5	486972.99	11255	5
8	97862.878	997	475906.03	11468	5	486299.83	11223	5
7	97856.893	998	475219.07	11436	5	485626.57	11191	5
6	97850.898	1000	474534.01	11405	5	484956.21	11160	5
5	97844.896	1001	473850.83	11373	5	484287.74	11128	5
4	97838.885	1002	473169.54	11332	5	483621.14	11097	5
3	97832.867	1004	472490.12	11311	5	482956.43	11066	5
2	97826.839	1005	471812.56	11280	5	482293.57	11035	5
1	97820.804	1006	471136.86	11280	5	481632.58	11004	5
0	97814.760	1008	470463.01	11218	5	480937.43	10673	5

12. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	20819.62	474	21286.06	507	102240.385	1055
2	20848.07	474	21316.47	507	102246.721	1057
3	20876.52	474	21346.88	507	102253.065	1058
4	28904.97	474	21377.30	507	102259.420	1060
5	20933.41	474	21407.72	507	102265.783	1062
6	20961.86	474	21438.14	507	102272.156	1063
7	20990.30	474	21468.57	507	102278.539	1065
8	21018.74	474	21499.00	507	102284.931	1066
9	21047.18	474	21529.44	507	102291.332	1068
10	21075.61	474	21559.88	507	102297.743	1070
11	21104.05	474	21590.32	507	102304.163	1071
12	21132.48	474	21620.76	507	102310.593	1073
13	21160.91	474	21651.22	508	102317.033	1074
14	21189.34	474	21681.67	508	102323.481	1076
15	21217.77	474	21712.13	508	102329.939	1077
16	21246.19	474	21742.59	508	102336.407	1079
17	21274.62	474	21773.06	508	102342.884	1080
18	21303.04	474	21803.53	508	102349.371	1082
19	21331.46	474	21834.00	508	102355.867	1084
20	21359.88	474	21864.48	508	102362.373	1085
21	21388.29	474	21894.96	508	102368.888	1087
22	21416.71	474	21925.44	508	102375.412	1088
23	21445.12	474	21955.93	508	102381.947	1090
24	21473.53	473	21986.43	508	102388.490	1091
25	21501.94	473	22016.92	508	102395.043	1093
26	21530.35	473	22047.42	508	102401.606	1095
27	21558.75	473	22077.93	508	102408.178	1096
28	21587.16	473	22108.44	509	102414.760	1098
29	21615.56	473	22138.95	509	102421.351	1099
30	21643.96	473	22169.47	509	102427.951	1101

77.Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
59	97808.708	1009	469791.00	11187	5	480316.13	10942	5
58	97802.648	1011	469120.83	11157	5	479660.66	10912	5
57	97796.579	1012	468452.48	11126	5	479007.02	10881	5
56	97790.502	1013	467785.95	11096	5	478355.20	10851	5
55	97784.417	1015	467121.24	11066	5	477705.19	10821	5
54	97778.324	1016	466458.32	11036	5	477056.99	10791	5
53	97772.222	1018	465797.21	11006	5	476410.57	10761	5
52	97766.112	1019	465137.88	11976	5	475765.96	10731	5
51	97759.994	1020	464480.34	10947	5	475123.12	10702	5
50	97753.807	1022	463824.56	10917	5	474482.06	10672	5
49	97747.732	1023	463170.56	10888	5	473842.77	10643	5
48	97741.589	1024	462518.32	10859	5	473205.23	10613	5
47	97735.438	1026	461867.83	10829	5	472569.45	10584	5
46	97729.278	1027	461219.08	10800	5	471935.42	10555	5
45	97723.111	1029	460572.07	10771	5	471303.12	10526	5
44	97716.934	1030	459926.80	10743	5	470672.56	10497	5
43	97710.750	1031	459283.24	10714	5	470043.72	10469	5
42	97704.557	1033	458641.41	10685	5	469416.60	10420	5
41	97698.356	1034	458001.29	10657	5	468791.19	10412	5
40	97692.147	1035	457362.87	10629	5	468167.48	10383	5
39	97685.930	1037	456726.14	10600	5	467546.48	10355	5
38	97679.704	1038	456091.11	10572	5	466925.16	10327	5
37	97673.470	1040	455457.75	10544	5	466306.52	10299	5
36	97667.228	1041	454826.08	10517	5	465689.56	10271	5
35	97660.977	1042	454196.07	10489	5	465074.27	10243	5
34	97654.718	1044	453567.73	10461	5	464460.64	10216	5
33	97648.451	1045	452941.05	10433	5	463848.67	10188	5
32	97642.176	1046	452316.01	10406	5	463238.35	10[illegible]61	5
31	97635.893	1048	451692.61	10379	5	462629.67	10[illegible]33	5
30	97629.601	1049	451070.85	10351	5	462022.63	10106	5

12. Grad.

Prima	Sinus	10''	Tangens	10''	Secans	10''
31	21672.36	473	22199.99	509	102434.562	1103
32	21700.76	473	22230.51	509	102441.181	1104
33	21729.15	473	22261.04	509	102447.810	1106
34	21757.54	473	22291.57	509	102454.449	1107
35	21785.93	473	22322.11	509	102461.298	1109
36	21814.32	473	22352.65	509	102467.755	1111
37	21842.71	473	22383.19	509	102474.422	1112
38	21871.10	473	22413.74	509	102481.100	1114
39	21899.48	473	22444.29	509	102487.786	1115
40	21927.86	473	22474.85	509	102494.482	1117
41	21956.24	473	22505.41	509	102501.187	1119
42	21984.62	473	22535.97	509	102507.903	1120
43	22013.00	473	22566.54	509	102514.627	1122
44	22041.37	473	22597.11	510	102521.361	1123
45	22069.74	473	22627.69	510	102528.105	1125
46	22098.11	473	22658.27	510	102534.858	1126
47	22126.48	473	22688.85	510	102541.621	1128
48	22154.85	473	22719.44	510	102548.394	1120
49	22183.21	473	22750.03	510	102555.176	1131
50	22211.58	473	22780.63	510	102561.967	1133
51	22239.94	473	22811.23	510	102568.769	1134
52	22268.30	473	22841.84	510	102575.579	1136
53	22296.66	473	22872.44	510	102582.399	1138
54	22325.01	473	22903.06	510	102589.230	1139
55	22353.36	473	22933.67	510	102596.070	1141
56	22381.72	473	22964.29	510	102602.918	1142
57	22410.07	472	22994.92	510	102609.777	1144
58	22438.41	472	23025.55	511	102616.645	1146
59	22466.76	472	23056.18	511	102623.523	1147
60	22495.10	472	23086.82	511	102630.411	1149

77. Grad.

Prima	Sinus	10''	Tangens	10''	In	Secans	10''	In
29	97623.301	1051	450450.72	10324	4	461417.22	10079	4
28	97616.992	1052	449832.21	10297	4	460813.43	10052	4
27	97610.676	1053	449215.32	10270	4	460211.26	10025	4
26	97604.351	1055	448600.04	10244	4	459610.70	9998	4
25	97598.018	1056	447986.36	10217	4	459011.74	9971	4
24	97591.676	1057	447374.28	10190	4	458414.39	9945	4
23	97585.327	1059	446763.79	10164	4	457813.62	9918	4
22	97578.969	1060	446154.89	10137	4	457224.44	9893	4
21	97572.602	1062	445547.56	10111	4	456631.83	9866	4
20	97566.228	1063	444941.81	10085	4	456040.80	9840	4
19	97559.845	1064	444337.62	10059	4	455451.34	9814	4
18	97553.454	1066	443734.99	10033	4	454863.44	9788	4
17	97547.055	1067	443133.92	10007	4	454277.09	9762	4
16	97540.647	1068	442534.39	9981	4	453692.29	9736	4
15	97534.232	1070	441936.41	9956	4	453109.03	9710	4
14	97527.808	1071	441339.96	9930	4	452527.30	9685	4
13	97521.376	1073	440745.04	9905	4	451947.11	9659	4
12	97514.935	1074	440151.64	9879	4	451368.44	9634	4
11	97508.487	1075	439559.76	9854	4	450791.29	9609	4
10	97502.030	1077	438969.40	9829	4	450215.65	9584	4
9	97495.565	1078	438380.54	9804	4	449641.52	9558	4
8	97489.091	1079	437793.17	9779	4	449068.89	9533	4
7	97482.609	1081	437207.31	9754	4	448497.75	9509	4
6	97476.119	1082	436622.93	9729	4	447928.10	9484	4
5	97469.621	1084	436040.03	9705	4	447359.93	9459	4
4	97463.115	1085	435458.61	9680	4	446793.24	9435	4
3	97456.600	1086	434878.66	9656	4	446228.03	9410	4
2	97450.077	1088	434300.18	9631	4	445664.28	9386	4
1	97443.546	1089	433723.16	9607	4	445101.98	9361	4
0	97437.006	1090	433147.59	9583	4	444541.15	9337	4

13. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	22523.45	472	23117.46	511	102637.308	1150
2	22551.79	472	23148.11	511	102644.215	1152
3	22580.13	472	23178.75	511	102651.131	1154
4	22608.46	472	23209.41	511	102658.057	1155
5	22636.80	472	23240.07	511	102664.993	1157
6	22665.13	472	23270.73	511	102671.938	1158
7	22693.46	472	23301.39	511	102678.893	1160
8	22721.79	472	23332.06	511	102685.857	1162
9	22750.12	472	23362.74	511	102692.831	1163
10	22778.44	472	23393.42	511	102699.815	1165
11	22806.77	472	23424.10	511	102706.809	1166
12	22835.09	472	23454.79	511	102713.812	1168
13	22863.41	472	23485.48	512	102720.824	1170
14	22891.72	472	23516.17	512	102727.847	1171
15	22920.04	472	23546.87	512	102734.879	1173
16	22948.35	472	23577.58	512	102741.920	1175
17	22976.66	472	23608.29	512	102748.972	1176
18	23004.97	472	23639.00	512	102756.033	1178
19	23033.28	472	23669.71	512	102763.103	1179
20	23061.59	472	23700.43	512	102770.184	1181
21	23089.89	472	23731.16	512	102777.274	1183
22	23118.19	472	23761.89	512	102784.373	1184
23	23146.49	472	23792.62	512	102791.483	1186
24	23174.79	472	23823.36	512	102798.602	1187
25	23203.09	472	23854.10	512	102805.730	1189
26	23231.38	472	23884.85	512	102812.869	1191
27	23259.67	472	23915.60	513	102820.017	1192
28	23287.96	471	23946.35	513	102827.175	1194
29	23316.25	471	23977.11	513	102834.342	1196
30	23344.54	471	24007.88	513	102841.519	1197

76. Grad.

Prima	Sinus	10″	Tangens	10″	In	Secans	10″	In
59	97430.459	1092	432573.47	9559	4	443981.76	9313	4
58	97423.903	1093	432000.79	9535	4	443423.82	9289	4
57	97417.339	1095	431429.55	9511	4	442867.31	9265	4
56	97410.766	1096	430859.74	9487	4	442312.24	9241	4
55	97404.896	1097	430291.36	9463	4	441758.59	9218	4
54	97397.597	1099	420724.40	9439	4	441206.37	9194	4
53	97391.000	1100	429158.85	9416	4	440655.56	9170	4
52	97384.394	1101	428594.72	9392	4	440106.16	9157	4
51	97377.781	1103	428031.99	9369	4	439558.17	9123	4
50	97371.159	1104	427470.66	9346	4	439011.58	9100	4
49	97364.529	1106	426910.72	9323	4	438466.38	9077	4
48	97357.890	1107	426352.18	9299	4	437922.57	9054	4
47	97351.244	1108	425795.70	9276	4	437380.15	9031	4
46	97344.589	1110	425239.23	9254	4	436839.10	9008	4
45	97337.926	1111	424684.82	9231	4	436299.43	8985	4
44	97331.255	1112	424131.77	9208	4	435761.13	8962	4
43	97324.575	1114	423580.09	9185	4	435224.19	8940	4
42	97317.887	1115	423029.77	9163	4	434688.61	8917	4
41	97311.191	1117	422480.80	9140	4	434154.38	8894	4
40	97304.487	1118	421933.18	9118	4	433621.50	8872	4
39	97297.775	1119	421386.90	9095	4	433089.96	8850	4
38	97291.054	1121	420841.95	9073	4	432559.77	8827	4
37	97284.345	1122	420298.34	9051	4	432030.90	8805	4
36	97277.588	1123	419756.06	9029	4	431503.36	8783	4
35	97270.842	1125	419215.10	9007	4	430977.15	8761	4
34	97264.089	1126	418675.46	8985	4	430452.25	8739	4
33	97257.327	1128	418137.13	8963	4	429928.67	8717	4
32	97250.557	1129	417600.11	8941	4	429406.40	8695	4
31	97243.779	1130	417064.40	8920	4	428885.43	8674	4
30	97236.992	1132	416529.98	8898	4	428365.76	8652	4

13.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	23372.82	471	24038.64	513	102848.706	1199
32	23401.10	471	24069.41	513	102855.903	1200
33	23429.38	471	24100.19	513	102863.109	1202
34	23457.66	471	24130.97	513	102870.325	1204
35	23485.94	471	24161.76	513	102877.551	1205
36	23514.21	471	24192.55	513	102884.786	1207
37	23542.48	471	24223.34	513	102892.032	1208
38	23570.75	471	24254.14	513	102899.287	1210
39	23599.02	471	24284.94	513	102906.551	1212
40	23627.29	471	24315.75	513	102913.826	1213
41	23655.55	471	24346.56	514	102921.110	1215
42	23683.81	471	24377.37	514	102928.404	1217
43	23712.07	471	24408.19	514	102935.707	1218
44	23740.33	471	24439.02	514	102943.021	1220
45	23768.59	471	24469.84	514	102950.344	1221
46	23796.84	471	24500.68	514	102957.677	1223
47	23825.10	471	24531.51	514	102965.019	1225
48	23853.35	471	24562.36	514	102972.372	1226
49	23881.59	471	24593.50	514	102979.734	1228
50	23909.84	471	24624.05	514	102987.106	1230
51	23938.08	471	24654.91	514	102994.487	1231
52	23966.33	471	24685.77	514	103001.879	1233
53	23994.57	471	24716.63	514	103009.280	1234
54	24022.80	471	24747.50	514	103016.691	1236
55	24051.04	471	24778.37	515	103024.112	1238
56	24079.27	471	24809.25	515	103031.543	1239
57	24107.51	471	24840.13	515	103038.983	1241
58	24135.74	470	24871.01	515	103046.433	1245
59	24163.96	470	24901.90	515	103053.893	1244
60	24192.19	470	24932.80	515	103061.363	1246

76.Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	97230.197	1133	415996.85	8876	4	427847.38	8631	4
28	97223.394	1134	415465.01	8855	4	427330.29	8609	4
27	97216.583	1136	414934.46	8834	4	426814.49	8658	4
26	97209.764	1137	414405.19	8812	4	426299.96	8567	4
25	97202.936	1139	413877.19	8791	4	425786.71	8545	4
24	97196.100	1140	413350.46	8770	3	425274.74	8524	3
23	97189.256	1141	412824.99	8749	3	424764.02	8503	3
22	97182.404	1143	412300.79	8728	3	424254.57	8480	3
21	97175.543	1144	411777.84	8707	3	423746.37	8460	3
20	97168.674	1145	411256.14	8686	3	423239.43	8440	3
19	97161.797	1147	410735.69	8666	3	422733.73	8420	3
18	97154.912	1148	410216.49	8645	3	422229.28	8399	3
17	97148.019	1149	409698.51	8624	3	421726.06	8378	3
16	97141.117	1151	409181.78	8604	3	421224.08	8358	3
15	97134.207	1152	408666.27	8583	3	420723.33	8337	3
14	97127.209	1154	408151.98	8563	3	420223.80	8317	3
13	97120.363	1155	407638.92	8543	3	419725.49	8297	3
12	97113.428	1156	407127.07	8522	3	419228.40	8276	3
11	97106.485	1158	406616.43	8502	3	418732.52	8256	3
10	97099.534	1159	406107.00	8482	3	418237.85	8236	3
9	97092.575	1160	405598.77	8462	3	417744.37	8216	3
8	97085.608	1162	405091.74	8442	3	417252.10	8196	3
7	97078.632	1163	404585.90	8422	3	416761.02	8176	3
6	97071.648	1165	404081.25	8403	3	416271.13	8157	3
5	97064.656	1166	403577.79	8382	3	415782.43	8137	3
4	97057.656	1167	403075.50	8363	3	415294.91	8117	3
3	97050.647	1169	402574.40	8344	3	414808.56	8078	3
2	97043.631	1170	402074.46	8324	3	414323.39	8078	3
1	97036.606	1171	401575.70	8305	3	413839.39	8059	3
0	97029.573	1173	401078.09	8285	3	413356.55	8039	3

14. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	24220.41	470	24963.70	515	103068.843	1248
2	24248.63	470	24994.60	515	103076.332	1249
3	24276.85	470	25025.51	515	103083.831	1251
4	24305.07	470	25056.42	515	103091.340	1252
5	24333.29	470	25087.34	515	103098.859	1254
6	24361.50	470	25118.26	515	103106.388	1256
7	24389.71	470	25149.19	515	103113.926	1257
8	24417.92	470	25180.12	516	103120.474	1259
9	24446.13	470	25211.06	516	103129.033	1261
10	24474.33	470	25242.00	516	103136.601	1262
11	24502.54	470	25272.94	516	103144.178	1264
12	24530.74	470	25305.89	516	103151.766	1266
13	24558.94	470	25334.84	516	103159.364	1267
14	24587.13	470	25365.80	516	103166.971	1269
15	24615.33	470	25396.76	516	103174.588	1272
16	24643.52	470	25427.73	516	103182.215	1271
17	24671.71	470	25458.70	516	103189.852	1274
18	24699.90	470	25489.68	516	103197.499	1275
19	24728.09	470	25520.66	516	103205.156	1277
20	24756.27	470	25551.65	516	103212.822	1279
21	24784.45	470	25582.64	517	103220.499	1280
22	24812.63	470	25613.63	517	103228.185	1282
23	24840.81	470	25644.63	517	103235.881	1284
24	24868.99	470	25675.64	517	103243.587	1285
25	24897.16	470	25706.64	517	103251.303	1287
26	24925.33	469	25737.66	517	103259.029	1289
27	24953.50	469	25768.68	517	103266.765	1290
28	24981.67	469	25799.70	517	103274.510	1292
29	25009.84	469	25830.73	517	103282.266	1294
30	25038.00	469	25861.76	517	103290.031	1295

75.Grad.

Prima	Sinus	10"	Tangens	10"	I	Secans	10"	I
59	97022.531	1174	400581.65	8266	3	412874.87	8020	3
58	97015.482	1175	400086.36	8247	3	412394.35	8001	3
57	97008.424	1177	399592.23	8228	3	411914.98	7981	3
56	97001.358	1178	399099.24	8209	3	411436.75	7962	3
55	96994.284	1180	398607.39	8189	3	410959.67	7943	3
54	96987.202	1181	398116.69	8171	3	410483.73	7924	3
53	96980.111	1182	397627.12	8152	3	410008.93	7906	3
52	96973.012	1184	397138.68	8133	3	409535.26	7887	3
51	96965.905	1185	396651.36	8114	3	409062.72	7868	3
50	96958.790	1186	396165.18	8095	3	408591.30	7849	3
49	96951.667	1188	395680.11	8077	3	408120.99	7831	3
48	96944.535	1189	395196.15	8058	3	407651.81	7812	3
47	96937.395	1191	394713.31	8040	3	407183.74	7794	3
46	96930.247	1192	394231.57	8020	3	406716.77	7775	3
45	96923.091	1193	393750.94	8003	3	406250.91	7757	3
44	96915.927	1195	393271.41	7985	3	405786.15	7738	3
43	96908.754	1196	392792.97	7966	3	405322.49	7720	3
42	96901.573	1197	392315.63	7948	3	404859.92	7702	3
41	96894.384	1199	391839.37	7930	3	404398.44	7684	3
40	96887.187	1200	391364.20	7912	3	403938.04	7666	3
39	96879.981	1201	390890.11	7894	3	403478.72	7648	3
38	96872.768	1203	390417.10	7876	3	403020.48	7630	3
37	96865.546	1204	389945.16	7858	3	402563.32	7612	3
36	96858.316	1206	389474.28	7840	3	402107.22	7594	3
35	96851.078	1207	389004.48	7823	3	401652.19	7576	3
34	96843.832	1208	388535.74	7805	3	401198.23	7559	3
33	96836.577	1210	388068.05	7787	3	400745.32	7541	3
32	96829.314	1211	387601.42	7770	3	400293.47	7524	3
31	96822.043	1212	387135.84	7753	3	399842.67	7506	3
30	96814.764	1214	386671.31	7735	3	399392.92	7489	3

14. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	25066.16	469	25892.79	517	103297.807	1297
32	25094.32	469	25923.84	517	103305.592	1299
33	25122.48	469	25954.88	517	103313.387	1300
34	25150.63	469	25985.93	518	103321.192	1302
35	25178.78	469	26016.99	518	103329.007	1303
36	25206.94	469	26048.05	518	103336.832	1305
37	25235.08	469	26079.11	518	103344.667	1307
38	25263.23	469	26110.18	518	103352.512	1308
39	25291.37	469	26141.26	518	103360.366	1310
40	25319.52	469	26172.34	518	103368.231	1312
41	25347.66	469	26203.42	518	103376.106	1313
42	25375.79	469	26234.51	518	103383.990	1315
43	25403.93	469	26265.60	518	103391.885	1317
44	25432.06	469	26296.70	518	103399.789	1318
45	25460.19	469	26327.80	518	103407.704	1320
46	25488.32	469	26358.91	518	103415.628	1322
47	25516.45	469	26390.02	519	103423.563	1323
48	25544.58	469	26421.14	519	103431.507	1325
49	25572.70	469	26452.26	519	103439.461	1327
50	25600.82	469	26483.39	519	103447.426	1328
51	25628.94	469	26514.52	519	103455.400	1330
52	25657.05	469	26545.66	519	103463.384	1332
53	25685.17	469	26576.80	519	103471.378	1333
54	25713.28	469	26607.94	519	103479.383	1335
55	25741.39	468	26639.09	519	103487.397	1337
56	25769.50	468	26670.25	519	103495.421	1338
57	25797.60	468	26701.41	519	103503.455	1340
58	25825.70	468	26732.57	519	103511.499	1342
59	25853.81	468	26763.74	520	103519.554	1343
60	25881.90	468	26794.92	520	103527.618	1345

75. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	96807.477	1215	386207.82	7718	3	398944.21	7471	3
28	96800.181	1216	385745.37	7700	3	398496.54	7454	3
27	96792.877	1218	385283.96	7683	3	398049.91	7437	3
26	96785.565	1219	384823.58	7666	3	397604.31	7419	3
25	96778.245	1221	384364.23	7649	3	397159.75	7402	3
24	96770.917	1222	383905.91	7632	3	396716.21	7385	3
23	96763.581	1223	383448.61	7615	3	396273.69	7368	3
22	96756.236	1225	382992.33	7598	3	395832.19	7351	3
21	96748.883	1226	382537.07	7581	3	395391.71	7334	3
20	96741.522	1227	382082.81	7564	3	394952.24	7317	3
19	96734.153	1229	381629.57	7547	3	394513.78	7301	3
18	96726.775	1230	381177.33	7530	3	394076.33	7284	3
17	96711.390	1231	380726.09	7514	3	393639.88	7267	3
16	96722.996	1233	380275.85	7497	3	393204.43	7251	3
15	96704.594	1234	379826.61	7481	3	392769.97	7234	3
14	96697.184	1236	379378.35	7464	3	392336.51	7218	3
13	96689.765	1237	378931.09	7445	3	391904.03	7201	3
12	96682.339	1238	378484.81	7431	3	391472.54	7185	3
11	96674.904	1240	378039.51	7415	3	391042.03	7168	3
10	96667.461	1241	377595.19	7399	3	390612.50	7152	3
9	96660.010	1242	377151.85	7382	3	390183.95	7136	3
8	96652.551	1244	376709.47	7366	3	389756.37	7120	3
7	96645.084	1245	376268.07	7350	3	389329.76	7103	3
6	96637.608	1246	375827.63	7334	3	388904.11	7087	3
5	96630.124	1248	375388.15	7318	3	388479.43	7071	3
4	96622.632	1249	374949.63	7302	3	388055.70	7055	3
3	96915.132	1251	374512.07	7286	3	387632.93	7040	3
2	96607.624	1252	374075.46	7270	3	387211.12	7024	3
1	96600.107	1253	373639.80	7254	3	386790.25	7008	3
0	96592.583	1255	373205.08	7239	3	386370.33	6992	3

15. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	25910.00	468	26826.10	520	103535.692	1347
2	25938.09	468	26857.28	520	103543.777	1348
3	25966.19	468	26838.47	520	103551.871	1350
4	25994.28	468	26919.67	520	103559.975	1352
5	26022.36	468	26950.87	520	103568.090	1353
6	26050.45	468	26982.07	520	103576.214	1355
7	26078.53	468	27013.28	520	103584.349	1357
8	26106.61	468	27044.49	520	103592.493	1358
9	26134.69	468	27075.71	520	103600.648	1360
10	26162.77	468	27106.94	520	103608.812	1362
11	26190.85	468	27138.16	521	103616.987	1363
12	26218.92	468	27169.40	521	103625.162	1365
13	26246.99	468	27200.64	521	103633.367	1367
14	26275.06	468	27231.88	521	103641.571	1368
15	26303.12	468	27263.13	521	103649.786	1370
16	26331.18	468	27394.68	521	103658.011	1372
17	26359.25	468	27325.64	521	103666.246	1373
18	26387.30	468	27356.90	521	103674.492	1375
19	26415.36	468	27388.17	521	103682.747	1377
20	26443.42	468	27419.45	521	103691.012	1379
21	26471.47	468	27450.72	521	103699.288	1380
22	26499.52	467	27482.01	521	103707.573	1382
23	26527.57	467	27513.30	522	103715.869	1384
24	26555.61	467	27544.59	522	103724.175	1385
25	26583.65	467	27575.89	522	103732.490	1387
26	26611.70	467	27607.19	522	103740.816	1389
27	26639.73	467	27638.50	522	103749.152	1390
28	26667.77	467	27669.81	522	103757.499	1392
29	26695.81	467	27701.13	522	103765.855	1394
30	26723.84	467	27732.45	522	103774.221	1395

74.Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
59	96585.050	1256	372771.31	7227	3	385951.35	6976	3
58	96577.509	1257	372338.47	7207	3	385533.32	6961	3
57	96569.960	1259	371906.58	7192	3	385116.22	6945	3
56	96562.402	1260	371475.61	7176	3	384700.05	6930	3
55	96554.837	1261	371045.58	7161	3	384284.82	6914	3
54	96547.263	1263	370646.48	7145	3	383870.51	6899	3
53	96539.681	1264	370188.29	7130	3	383457.13	6883	3
52	96532.091	1266	369761.03	7115	3	383044.67	6868	3
51	96524.493	1267	369334.69	7099	3	382633.13	6853	3
50	96516.887	1268	368909.27	7084	3	382222.51	6837	3
49	96509.272	1270	368484.75	7069	3	381812.80	6822	3
48	96501.649	1271	368061.15	7054	3	381403.99	6807	3
47	96494.019	1272	367638.45	7039	2	380996.10	6792	2
46	96486.380	1274	367216.65	7024	2	380589.11	6777	2
45	96478.732	1275	366795.75	7009	2	380183.01	6762	2
44	96471.077	1276	366375.75	6994	2	379777.82	6747	2
43	96463.414	1278	365956.65	6979	2	379373.52	6732	2
42	96455.747	1279	365538.43	6964	2	378970.11	6717	2
41	96448.062	1281	365121.11	6949	2	378567.60	6702	2
40	96440.374	1282	364704.67	6935	2	378165.96	6688	2
39	96432.678	1283	364289.11	6920	2	377765.22	6673	2
38	96424.974	1285	363874.44	6905	2	377365.35	6658	2
37	96417.261	1286	363460.64	6891	2	376966.36	6644	2
36	96409.540	1287	363047.71	6876	2	376568.24	6629	2
35	96401.812	1289	362635.65	6862	2	376171.00	6615	2
34	96394.075	1290	362224.47	6847	2	375774.62	6600	2
33	96383.330	1291	361814.15	6833	2	375379.11	6586	2
32	96378.576	1293	361404.69	6818	2	374984.47	6571	2
31	96370.815	1294	360996.09	6804	2	374590.68	6557	2
30	96363.045	1295	360588.35	6790	2	374197.75	6543	2

15. Grad.

Prim.	Sinus	10″	Tangens	10″	Secans	10″
31	26751.87	467	27763.78	522	103782.598	1397
32	26779.89	467	27795.12	522	103790.985	1399
33	26807.92	467	27826.45	522	103799.382	1400
34	26835.94	467	27857.80	522	103807.789	1402
35	26863.96	467	27889.15	523	103816.206	1404
36	26891.98	467	27910.50	523	103824.633	1406
37	26920.00	467	27951.86	523	103833.070	1407
38	26948.01	467	27983.22	523	103841.518	1409
39	26976.02	467	28014.59	523	103849.976	1401
40	27004.03	467	28045.97	523	103858.444	1412
41	27032.04	467	28077.35	523	103866.922	1414
42	27060.04	467	28108.73	523	103875.410	1416
43	27088.05	467	28140.12	523	103882.909	1417
44	27116.05	467	28171.52	523	103892.417	1419
45	27144.04	467	28202.92	523	103900.936	1421
46	27172.04	467	28234.32	523	103909.465	1422
47	27200.03	467	28265.73	524	103918.004	1424
48	27228.02	467	28297.15	524	103926.554	1426
49	27256.01	466	28328.57	524	103935.113	1428
50	27284.00	466	28359.99	524	103943.683	1429
51	27311.98	466	28391.42	524	103952.263	1431
52	27339.96	466	28422.86	524	103960.853	1433
53	27367.94	466	28454.30	524	103969.454	1434
54	27395.92	466	28485.75	524	103978.065	1436
55	27413.90	466	28517.20	524	103986.685	1438
56	27451.87	466	28548.66	524	103995.317	1440
57	27479.84	466	28580.12	524	104004.958	1441
58	27507.81	466	28611.59	524	104012.610	1443
59	27535.77	466	28643.07	525	104021.271	1445
60	27563.74	466	28674.54	525	104029.944	1446

74. Grad.

Pǝim	Sinus	10''	Tangens	10''	In	Se‹ans	10''	In
29	96355.268	1297	360181.46	6775	2	373805.68	6529	2
28	96347.482	1298	359775.43	6761	2	373414.46	6514	2
27	96339.688	1300	359370.24	6747	2	373024.09	6500	2
26	96331.885	1301	358965.90	6733	2	372634.57	6486	2
25	96324.075	1302	358562.41	6719	2	372245.89	6472	2
24	96316.752	1304	358159.75	6705	2	371858.05	6455	2
23	96308.430	1305	357757.94	6691	2	371471.05	6444	2
22	96300.595	1306	357356.95	6677	2	371084.89	6430	2
21	96292.752	1308	356956.81	6663	2	370699.56	6416	2
20	96284.901	1309	356557.49	6650	2	370315.06	6403	2
19	96277.042	1310	356159.00	6636	2	369931.39	6389	2
18	96269.175	1312	355761.33	6622	2	369548.54	6375	2
17	96261.299	1313	355364.45	6618	2	369166.52	6361	2
16	96254.415	1314	354968.46	6595	2	368785.31	6348	2
15	96245.524	1316	354573.25	6581	2	368404.93	6334	2
14	96237.624	1317	354178.86	6568	2	368025.36	6321	2
13	96229.716	1319	353785.28	6554	2	367646.60	6307	2
12	96221.799	1320	353392.52	6541	2	367268.65	6293	2
11	96213.875	1321	353000.54	6529	2	366891.51	6288	2
10	96205.942	1323	352609.38	6514	2	366515.18	6267	2
9	96198.002	1324	352219.02	6500	2	366139.64	6243	2
8	96190.052	1325	351829.46	6487	2	365764.91	6240	2
7	96182.096	1327	351440.70	6474	2	365390.97	6227	2
6	96174.131	1328	351052.73	6461	2	365017.83	6214	2
5	96166.158	1329	350665.55	6447	2	364645.48	6200	2
4	96158.176	1331	350279.16	6434	2	364273.92	6187	2
3	96150.187	1332	349893.56	6421	2	363903.15	6174	2
2	96142.189	1333	349508.74	6408	2	363533.16	6161	2
1	96134.183	1335	349124.70	6395	2	363163.95	6148	2
0	96126.170	1336	348741.44	6382	2	362795.53	6135	2

16. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	27591.70	466	28706.02	525	104038.626	1448
2	27619.65	466	28737.51	525	104047.319	1450
3	27647.61	466	28769.00	525	104056.021	1451
4	27675.56	466	28800.50	525	104064.735	1453
5	27703.52	466	28832.01	525	104073.458	1455
6	27731.46	466	28863.52	525	104082.192	1457
7	27759.41	466	28895.03	525	104090.936	1458
8	27787.36	466	28926.55	525	104099.690	1460
9	27815.30	466	28958.08	525	104108.454	1462
10	27843.24	466	28989.61	526	104117.229	1463
11	27871.18	466	29021.14	526	104126.014	1465
12	27899.11	466	29052.69	526	104134.809	1467
13	27927.04	466	29084.23	526	104143.615	1469
14	27954.97	465	29115.78	526	104152.431	1470
15	27982.90	465	29147.34	526	104161.257	1472
16	28010.83	465	29178.90	526	104170.094	1474
17	28038.75	465	29210.47	526	104178.941	1475
18	28066.67	465	29242.05	526	104187.798	1478
19	28094.59	465	29273.62	526	104196.666	1479
20	28122.50	465	29305.21	526	104205.544	1481
21	28150.42	465	29336.80	527	104214.432	1482
22	28178.33	465	29368.39	527	104223.330	1484
23	28206.24	465	29399.99	527	104232.239	1486
24	28234.15	465	29431.60	527	104241.158	1488
25	28262.05	465	29463.21	527	104250.088	1489
26	28289.95	465	29494.83	527	104259.028	1490
27	28317.85	465	29526.45	527	104267.978	1493
28	28345.75	465	29558.08	527	104276.939	1494
29	28373.64	465	29589.71	527	104285.910	1496
30	28401.53	465	29621.35	527	104294.891	1498

73.Grad.

Prima	Sinus	10"	Tangens	10"	1m	Secans	10"	1m
59	96118.146	1338	348358.96	6369	2	362427.88	6122	2
58	96110.117	1339	347977.26	6356	2	362061.00	6109	2
57	96102.079	1340	347596.32	6344	2	361694.90	6096	2
56	96094.033	1342	347216.16	6331	2	361329.57	6084	2
55	96085.978	1343	346836.76	6318	2	360965.01	6071	2
54	96077.915	1344	346458.13	6315	2	360601.21	6058	2
53	96069.845	1346	346080.26	6293	2	360238.18	6045	2
52	96061.766	1347	345703.15	6280	2	359875.90	6033	2
51	96053.679	1349	345326.79	6267	2	359514.39	6020	2
50	96045.583	1350	344951.20	6255	2	359153.63	6007	2
49	96037.480	1351	344576.35	6242	2	358793.62	5995	2
48	96029.369	1352	344202.26	6230	2	358434.36	5982	2
47	96021.249	1354	343828.91	6217	2	358075.86	5970	2
46	96013.121	1355	343456.31	6205	2	357718.10	5957	2
45	96004.985	1357	343084.46	6192	2	357361.08	5945	2
44	95996.841	1358	342713.34	6180	2	357004.81	5933	2
43	95988.689	1359	342342.97	6168	2	356649.28	5920	2
42	95980.520	1361	341973.33	6156	2	356294.48	5908	2
41	95972.361	1362	341604.43	6143	2	355940.42	5896	2
40	95964.184	1363	341236.26	6131	2	355587.10	5884	2
39	95956.000	1365	340868.82	6119	2	355234.50	5872	2
38	95947.807	1366	340502.10	6107	2	354882.63	5859	2
37	95939.606	1367	340136.12	6095	2	354531.49	5847	2
36	95931.397	1369	339770.85	6089	2	354181.07	5835	2
35	95923.180	1370	339406.31	6071	2	353831.38	5823	2
34	95914.955	1371	339042.49	6059	2	353482.40	5811	2
33	95906.722	1373	338679.38	6047	2	353134.14	5799	2
32	95898.481	1374	338316.99	6035	2	352786.60	5787	2
31	95890.231	1375	337955.31	6023	2	352439.77	5776	2
30	95881.973	1377	337594.34	6011	2	352093.65	5764	2

O

16. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	28429.42	465	29652.99	527	104303.883	1500
32	28457.31	465	29684.64	528	104312.885	1501
33	28485.20	465	29716.30	528	104321.898	1503
34	28513.08	465	29747.96	528	104330.921	1505
35	28540.96	465	29779.62	528	104339.954	1507
36	28568.84	465	29811.29	528	104348.998	1508
37	28596.71	465	29842.97	528	104358.052	1510
38	28624.58	465	29874.65	528	104367.116	1512
39	28652.45	464	29906.34	528	104376.191	1513
40	28680.32	464	29938.03	528	104385.276	1515
41	28708.19	464	29969.73	528	104394.372	1517
42	28736.05	464	30001.44	528	104403.478	1519
43	28763.91	464	30033.15	529	104412.595	1520
44	28791.77	464	30064.86	529	104421.722	1522
45	28819.63	464	30096.58	529	104430.859	1524
46	28847.48	464	30128.31	529	104440.007	1526
47	28875.33	464	30160.04	529	104449.165	1527
48	28903.18	464	30191.78	529	104458.334	1529
49	28931.03	464	30223.52	529	104467.513	1531
50	28958.87	464	30255.27	529	104476.703	1533
51	28986.71	464	30287.03	529	104485.903	1534
52	29014.55	464	30318.79	529	104495.114	1536
53	29042.38	464	30350.55	529	104504.335	1538
54	29070.22	464	30382.32	530	104513.566	1540
55	29098.05	464	30414.10	530	104522.808	1541
56	29125.88	464	30445.88	530	104532.061	1543
57	29153.71	464	30477.67	530	104541.324	1545
58	29181.53	464	30509.46	530	104550.597	1547
59	29209.35	464	30541.26	530	104559.881	1548
60	29237.17	464	30573.07	530	104569.176	1550

73. Grad.

Prim.	Sinus	10"	Tangens	10"	b	Secans	10"	In
29	95873.708	1378	337234.08	5999	2	351748.24	5752	2
28	95865.434	1380	336874.53	5988	2	351403.54	5740	2
27	95857.152	1381	336515.68	5976	2	351059.54	5728	2
26	95848.862	1382	336157.53	5964	2	350716.25	5717	2
25	95840.564	1384	335800.08	5953	2	350373.65	5705	2
24	95832.257	1385	335443.33	5941	2	350031.75	5693	2
23	95823.943	1386	335087.27	5929	2	349690.55	5682	2
22	95815.621	1388	334731.91	5918	2	349350.04	5670	2
21	95807.290	1389	334377.24	5906	2	349010.23	5659	2
20	95798.951	1390	334023.26	5895	2	348671.10	5647	2
19	95790.604	1392	333669.97	5883	2	348332.67	5636	2
18	95782.249	1393	333317.36	5872	2	347994.92	5624	2
17	95773.886	1394	332965.43	5861	2	347657.85	5613	2
16	95765.515	1396	332614.19	5849	2	347321.46	5602	2
15	95757.136	1397	332263.62	5838	2	346985.76	5590	2
14	95748.749	1398	331913.73	5827	2	346650.73	5579	2
13	95740.353	1400	331564.52	5816	2	346316.37	5565	2
12	95731.950	1401	331215.98	5804	2	345982.69	5557	2
11	95723.538	1402	330868.11	5793	2	345649.69	5545	2
10	95715.118	1404	330520.91	5782	2	345317.35	5534	2
9	95706.691	1405	330174.37	5771	2	344985.68	5523	2
8	95698.255	1407	329828.51	5760	2	344654.67	5512	2
7	95689.811	1408	329483.30	5749	2	344324.33	5501	2
6	95681.358	1409	329138.76	5738	2	343994.65	5490	2
5	95672.898	1411	328794.87	5727	2	343665.63	5479	2
4	95664.430	1412	328451.64	5716	2	343337.27	5468	2
3	95655.953	1413	328109.07	5705	2	343009.56	5457	2
2	95647.469	1415	327767.15	5694	2	342682.51	5446	2
1	95638.976	1416	327425.88	5683	2	342356.11	5435	2
0	95630.476	1417	327085.26	5672	2	342030.36	5425	2

17. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	29264.99	464	30604.88	530	104578.481	1552
2	29292.80	464	30636.69	530	104587.796	1554
3	29320.61	463	30668.52	530	104597.122	1555
4	29348.42	463	30700.34	531	104606.458	1557
5	29376.23	463	30732.18	531	104615.805	1559
6	29404.03	463	30764.02	531	104625.163	1561
7	29431.83	463	30795.86	531	104634.531	1562
8	29459.63	463	30827.71	531	104643.910	1564
9	29487.43	463	30859.57	531	104653.299	1566
10	29515.22	463	30891.43	531	104662.698	1568
11	29543.02	463	30923.30	531	104672.109	1570
12	29570.80	463	30955.17	531	104681.529	1571
13	29598.59	463	30987.05	531	104690.961	1573
14	29626.38	463	31018.93	531	104700.403	1575
15	29654.16	463	31050.82	532	104709.855	1576
16	29681.94	463	31082.72	532	104719.318	1578
17	29709.71	463	31114.62	532	104728.792	1580
18	29737.49	463	31146.53	532	104738.276	1582
19	29765.26	463	31178.44	532	104747.771	1583
20	29793.03	463	31210.36	532	104757.276	1585
21	29820.79	463	31242.29	532	104766.792	1587
22	29848.56	463	31274.22	532	104776.318	1589
23	29876.32	463	31306.16	532	104785.855	1591
24	29904.08	463	31338.10	532	104795.403	1592
25	29931.84	463	31370.05	533	104804.962	1594
26	29959.59	463	31402.00	533	104814.530	1596
27	29987.34	462	31433.96	533	104824.110	1598
28	30015.09	462	31465.93	533	104833.700	1599
29	30042.84	462	31497.90	533	104843.301	1601
30	30070.58	462	31529.88	533	104852.912	1603

72. Grad.

Prima	Sinus	10″	Tangens	10″	In	Secans	10″	In
59	95621.967	1419	326745.29	5662	2	341705.26	5414	2
58	95613.450	1420	326405.96	5651	2	341380.80	5403	2
57	95604.925	1421	326067.28	5640	2	341056.99	5392	2
56	95596.392	1423	325729.24	5630	2	340733.82	5382	2
55	95587.851	1424	325391.84	5619	2	340411.30	5371	2
54	95579.301	1425	325055.08	5608	2	340089.41	5360	2
53	95570.744	1427	324718.95	5598	2	339768.15	5350	2
52	95562.179	1428	324383.46	5587	2	339447.54	5339	2
51	95553.605	1429	324048.60	5576	2	339127.55	5329	2
50	95545.024	1431	323714.38	5566	2	338808.20	5318	2
49	95536.434	1432	323380.78	5556	2	338489.48	5308	2
48	95527.836	1434	323047.80	5545	2	338171.38	5297	2
47	95519.230	1435	322715.46	5535	2	337853.91	5286	2
46	95510.616	1436	322383.73	5524	2	337537.07	5276	2
45	95501.994	1438	322052.63	5514	2	337220.84	5266	2
44	95493.364	1439	321722.15	5514	2	336905.24	5256	2
43	95484.726	1440	321392.28	5493	2	336590.26	5245	2
42	95476.080	1442	321063.04	5483	2	336275.89	5235	2
41	95467.426	1443	320734.40	5473	2	335962.14	5225	2
40	95458.763	1444	320406.38	5463	2	335649.00	5215	2
39	95450.093	1446	320078.97	5453	2	335336.47	5205	2
38	95441.414	1447	319752.17	5442	2	335024.55	5194	2
37	95432.728	1448	319425.98	5432	2	334713.24	5184	2
36	95424.033	1450	319100.39	5422	2	334402.54	5174	2
35	95415.330	1451	318775.40	5412	2	334092.44	5164	2
34	95406.619	1452	318451.02	5402	2	333782.94	5154	2
33	95397.900	1454	318127.24	5392	2	333474.05	5144	2
32	95389.173	1455	317804.06	5382	2	333156.75	5134	2
31	95380.438	1456	317481.47	5372	2	332858.05	5124	2
30	95371.695	1458	317159.48	5362	2	332550.95	5114	2

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17.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	30098.32	462	31561.86	533	104862.535	1605
32	30126.06	462	31593.85	533	104872.167	1606
33	30153.80	462	31625.85	533	104881.811	1608
34	30181.53	462	31657.85	533	104891.465	1610
35	30209.26	462	31689.85	533	104901.129	1612
36	30236.99	462	31721.87	534	104910.805	1614
37	30264.71	462	31753.89	534	104920.491	1615
38	30292.44	462	31785.91	534	104930.187	1617
39	30320.16	462	31817.94	534	104939.895	1619
40	30347.88	462	31849.98	534	104[illegible]49.613	1611
41	30375.59	462	31882.02	534	104959.341	1622
42	30403.31	462	31914.07	534	104969.081	1624
43	30431.02	462	31946.12	534	104978.831	16[illegible]6
44	30458.72	462	31978.19	534	104988.592	1628
45	30486.43	462	32010.25	534	104998.363	1630
46	30514.13	462	32042.32	535	105008.145	1631
47	30541.83	462	32074.40	535	105017.938	1633
48	30569.53	462	32106.49	535	105027.742	1635
49	30597.22	462	32138.58	535	105037.556	1637
50	30624.92	462	32170.67	535	105047.381	1639
51	30652.61	461	32202.78	535	105057.217	1640
52	30680.[illegible]	461	32234.88	535	105067.063	1642
53	30707.98	461	32267.00	535	105076.921	1644
54	30735.66	461	32299.12	535	105086.789	1646
55	30763.34	461	32331.25	535	105096.667	1647
56	30791.02	461	32363.38	536	105106.557	1649
57	30818.69	461	32395.52	536	105116.368	1651
58	30846.36	461	32427.66	536	105126.790	1653
59	30874.03	461	32459.81	536	105146.272	1655
60	30901.70	461	32491.97	536	105146.222	1656

72.Grad.

Prima	Sinus	10″	Tangens	10″	In	Secans	10′	In
29	95362.944	1459	316838.08	5352	2	332244.44	5104	2
28	95354.185	1460	316517.28	5343	2	331938.53	5094	2
27	95345.417	1462	316197.06	5333	2	331633.20	5085	2
26	95336.642	1463	315877.44	5323	2	331328.47	5075	2
25	95327.858	1464	315558.40	5313	2	331024.32	5065	2
24	95319.067	1466	315239.94	5304	2	330720.76	5055	2
23	95310.267	1467	314922.07	5294	2	330417.78	5046	2
22	95301.459	1468	314604.78	5284	2	330115.39	5036	2
21	95292.644	1470	314288.07	5274	2	329813.57	5026	2
20	95283.820	1471	313971.94	5265	2	329512.34	5017	2
19	95274.988	1473	313656.39	5255	2	329211.68	5007	2
18	95266.148	1474	313341.41	5246	2	328911.60	4997	2
17	95257.300	1475	313027.01	5236	2	328612.09	4988	2
16	95248.444	1477	312713.17	5227	2	328313.16	4978	2
15	95239.580	1478	312399.91	5217	2	328014.79	4969	2
14	95230.708	1479	312087.22	5218	2	327717.00	4959	2
13	95221.828	1481	311775.09	5198	2	327419.77	4950	2
12	95212.939	1482	311463.53	5189	2	327123.11	4940	2
11	95204.043	1483	311152.53	5179	2	326827.02	4931	2
10	95195.139	1485	310842.10	5170	2	326531.49	4922	2
9	95186.226	1486	310532.23	5161	2	326236.52	4912	2
8	95177.306	1487	310222.91	5151	2	325942.11	4903	2
7	95168.377	1489	309914.16	5142	2	325648.25	4894	2
6	95159.440	1490	309605.96	5133	2	325354.96	4884	2
5	95150.496	1491	309298.31	5124	2	325062.22	4875	2
4	95141.543	1493	308991.22	5114	2	324770.03	4866	2
3	95132.582	1494	308684.68	5105	2	324478.40	4857	2
2	95123.613	1495	308378.69	5096	2	324187.32	4848	2
1	95114.637	1497	308073.25	5087	2	323896.78	4838	2
0	95105.652	1498	307768.35	5078	2	323606.80	4829	2

18. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	30929.36	461	32524.13	536	105156.166	1658
2	30957.02	461	32556.30	536	105199.120	1660
3	30984.68	461	32588.48	536	105176.085	1662
4	31012.34	461	32620.66	536	105186.060	1664
5	31039.99	461	32652.84	537	105196.047	1665
6	31067.64	461	32685.04	537	105206.044	1667
7	31095.29	461	32717.24	537	105216.052	1669
8	31122.94	461	32749.44	537	105226.071	1671
9	31150.58	461	32781.65	537	105236.101	1673
10	31178.22	461	32813.87	537	105246.141	1674
11	31205.86	461	32846.10	537	105256.193	1676
12	31233.49	461	32878.33	537	105266.255	1678
13	31261.12	461	32910.56	537	105276.328	1680
14	31288.75	460	32142.81	537	105286.412	1682
15	31316.38	460	32975.05	538	105296.506	1683
16	31344.00	460	33007.31	538	105306.612	1685
17	31371.63	460	33039.57	538	105316.728	1687
18	31399.25	460	33071.84	538	105326.855	1689
19	31426.86	460	33104.11	538	105336.993	1691
20	31454.48	460	33136.39	538	105347.142	1693
21	31482.09	460	33168.68	538	105357.302	1694
22	31509.69	460	33200.97	538	105367.473	1696
23	31537.30	460	33233.27	538	105377.655	1698
24	31564.90	460	33265.57	538	105387.847	1600
25	31592.50	460	33297.88	539	105398.050	1702
26	31620.10	460	33330.20	539	105408.265	1703
27	31647.70	460	33362.52	539	105418.490	1705
28	31675.29	460	33394.85	539	105428.726	1707
29	31702.88	460	33427.19	539	105438.973	1709
30	31730.47	460	33459.53	539	105449.231	1711

71.Grad.

Prima	Sinus	10″	Tangens	10″	In	Secans	10″	In
59	95096.659	1499	307464.00	5069	1	323317.36	4820	1
58	95087.658	1501	307160.20	5060	1	323028.46	4811	1
57	95078.649	1502	306856.93	5051	1	322740.11	4802	1
56	95069.631	1503	306554.21	5042	1	322452.30	4793	1
55	95060.606	1505	306252.03	5033	1	322165.03	4784	1
[illegible]	95051.573	1506	305950.38	5024	1	321878.30	4775	1
53	95042.532	1507	305649.28	5015	1	321592.10	4766	1
52	95033.483	1509	305348.70	5006	1	321306.44	4757	1
51	95024.425	1510	305048.66	4997	1	321021.32	4749	1
50	95015.360	1511	304749.15	4988	1	320736.72	4740	1
49	95006.287	1513	304450.18	4979	1	320452.66	4731	1
48	94997.205	1514	304151.73	4970	1	320169.13	4722	1
47	94988.116	1515	303853.81	4962	1	319886.13	4713	1
46	94979.018	1517	303556.41	4953	1	319603.65	4704	1
45	94969.913	1518	303259.54	4944	1	319321.70	4696	1
44	94960.799	1519	302963.20	4935	1	319040.28	4697	1
43	94951.678	1521	302667.37	4927	1	318759.37	4678	1
42	94942.548	1522	302372.07	4918	1	318478.99	4669	1
41	94933.410	1523	302077.28	4909	1	318199.13	4661	1
40	94924.264	1525	301783.01	4901	1	317919.78	4652	1
39	94915.111	1526	301489.26	4892	1	317640.95	4644	1
38	94905.949	1528	301196.02	4884	1	317362.64	4635	1
37	94896.779	1529	300903.30	4875	1	317084.84	4626	1
36	94887.601	1530	300611.09	4867	1	316807.56	4618	1
35	94878 415	1532	300319.39	4858	1	316530.78	4609	1
34	94869.221	1533	300028.20	4850	1	316254.52	4601	1
33	94860.019	1534	299737.51	4841	1	315978.76	4592	1
32	94850.809	1536	299447.34	4833	1	315703.51	4584	1
31	94841.592	1537	299157.66	4824	1	315428.77	4576	1
30	94832.366	1538	298868.50	4816	1	315154.53	4567	1

18. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	31758.05	460	33491.88	539	105459.500	1713
32	31785.63	460	33524.23	539	105469.779	1714
33	31813.21	460	33556.60	539	105480.070	1716
34	31840.79	460	33588.96	539	105490.372	1718
35	31868.36	460	33621.34	540	105500.684	1720
36	31895.93	459	33653.72	540	105511.008	1722
37	31923.50	459	33686.10	540	105521.342	1723
38	31951.06	458	33718.50	540	105531.688	1725
39	31978.63	459	33750.90	540	105542.044	1727
40	32006.19	459	33783.30	540	105552.411	1729
41	32033.74	459	33815.71	540	105562.789	1731
42	32061.30	459	33848.13	540	105573.179	1733
43	32088.85	459	33880.56	540	105583.579	1734
44	32116.40	459	33912.99	541	105593.990	1736
45	32143.95	459	33945.43	541	105604.412	1738
46	32171.49	459	33977.87	541	105614.846	1740
47	32199.03	459	34010.32	541	105625.290	1742
48	32226.57	459	34042.78	541	105635.745	1744
49	32254.10	459	34075.24	541	105646.211	1745
50	32281.64	459	34107.71	541	105656.689	1747
51	32309.17	459	34140.19	541	105667.177	1749
52	32336.69	459	34172.67	541	105677.676	1751
53	32364.22	459	34205.16	541	105688.187	1753
54	32391.74	459	34237.65	542	105698.708	1755
55	32419.26	459	34270.15	542	105709.240	1756
56	32446.78	459	34302.66	542	105719.784	1758
57	32474.29	459	34335.18	542	105730.338	1760
58	32501.80	458	34367.70	542	105740.904	1762
59	32529.31	458	34400.23	542	105751.480	1764
60	32556.81	458	34432.76	542	105762.069	1766

71. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	94823.131	1540	298579.83	4808	1	314880.79	4559	1
28	94813.889	1541	298291.66	4799	1	314607.56	4550	1
27	94804.639	1542	298004.00	4791	1	314334.83	4542	1
26	94795.381	1544	297716.83	4783	1	314062.59	4534	1
25	94786.115	1545	297430.16	4774	1	313790.86	4525	1
24	94776.841	1546	297143.99	4766	1	313519.61	4517	1
23	94767.559	1548	296858.31	4758	1	313248.87	4509	1
22	94758.269	1549	296573.12	4750	1	312978.62	4500	1
21	94748.970	1550	296288.42	4742	1	312708.86	4493	1
20	94739.664	1552	296004.22	4733	1	312439.59	4484	1
19	94730.350	1553	295720.50	4725	1	312170.81	4476	1
18	94721.028	1554	295437.27	4717	1	311902.52	4468	1
17	94711.698	1556	295154.53	4709	1	311632.72	4460	1
16	94702.359	1557	294872.27	4701	1	311367.40	4452	1
15	94693.013	1558	294590.50	4693	1	311100.57	4444	1
14	94683.659	1560	294309.21	4685	1	310834.22	4439	1
13	94674.296	1561	294028.40	4677	1	310568.35	4428	1
12	94664.926	1562	293748.07	4669	1	310302.96	4420	1
11	94655.548	1564	293468.22	4661	1	310038.05	4411	1
10	94646.161	1565	293188.84	4653	1	309773.62	4404	1
9	94636.767	1566	292909.95	4645	1	309509.67	4396	1
8	94627.365	1568	292631.52	4637	1	309246.19	4388	1
7	94617.954	1569	292353.58	4629	1	308983.19	4380	1
6	94608.536	1570	292076.10	4621	1	308720.66	4372	1
5	94590.109	1572	291799.09	4613	1	308458.60	4364	1
4	94589.675	1573	291552.56	4606	1	308197.02	4357	1
3	94580.233	1574	291246.49	4598	1	307935.90	4349	1
2	94570.782	1576	290970.89	4590	1	307675.25	4341	1
1	94561.324	1577	290695.76	4582	1	307415.07	4333	1
0	94551.858	1578	290421.09	4575	1	307155.35	4325	1

19. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	32584.32	458	34465.30	542	105773.267	1766
2	32611.82	458	34497.85	542	105783.277	1769
3	32639.31	458	34530.40	543	105793.898	1771
4	32666.81	458	34562.96	543	105804.530	1773
5	32694.30	458	34595.53	543	105815.173	1775
6	32721.79	458	34628.10	543	105825.827	1777
7	32749.28	458	34660.68	543	105836.492	1779
8	32776.76	458	34693.27	543	105847.169	1780
9	32804.24	458	34725.86	543	105857.856	1782
10	32831.72	458	34758.46	543	105868.555	1784
11	32859.19	458	34791.07	543	105879.264	1786
12	32886.66	458	34823.68	544	105889.985	1788
13	32914.13	458	34856.30	544	105900.717	1790
14	32941.60	458	34888.93	544	105911.460	1792
15	32969.06	458	34921.56	544	105922.215	1793
16	32996.53	458	34954.20	544	105932.980	1795
17	33023.98	458	34986.85	544	105943.757	1797
18	33051.44	458	35019.50	544	105954.545	1799
19	33078.89	458	35052.16	544	105965.343	1801
20	33106.34	457	35084.83	544	105976.154	1803
21	33133.79	457	35117.50	545	105986.975	1805
22	33161.23	457	35150.18	545	105997.807	1806
23	33188.67	457	35182.87	545	106008.651	1808
24	33216.11	457	35215.56	545	106019.506	1810
25	33243.55	457	35248.26	545	106030.372	1812
26	33270.98	457	35280.96	545	106041.249	1814
27	33298.41	457	35313.68	545	106052.137	1816
28	33325.84	457	35356.40	545	106063.037	1818
29	33353.26	457	35379.12	545	106073.948	1820
30	33380.69	457	35411.86	545	106084.870	1821

70. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
59	94542.383	158[illegible]	290146.88	4567	1	306896.10	4318	1
58	94532.901	1581	289873.14	4559	1	306637.31	4301	1
57	94523.410	1582	289599.86	4551	1	306378.98	4302	1
56	94513.912	1584	289327.04	4544	1	306121.11	4295	1
55	94504.406	1585	289054.67	4536	1	305863.70	4287	1
54	94494.891	1586	288782.77	4529	1	305606.75	4279	1
53	94485.369	1588	288511.32	4521	1	305350.26	4272	1
52	94475.838	1589	288240.33	4513	1	305094.23	4264	1
51	94466.300	1590	287969.79	4506	1	304838.64	4257	1
50	94456.754	1592	287699.70	4498	1	304583.52	4249	1
49	94447.200	1593	287430.07	4491	1	304328.84	4241	1
48	94437.637	1594	287160.88	4483	1	304074.62	4233	1
47	94428.067	1596	286892.15	4476	1	303820.84	4226	1
46	94418.488	1597	286623.86	4468	1	303567.52	4219	1
45	94408.902	1593	286356.02	4461	1	303314.64	4211	1
44	94399.308	1600	286088.63	4453	1	303062.21	4204	1
43	94389.705	1601	285821.68	4446	1	302810.23	4197	1
42	94380.095	1602	285555.17	4439	1	302558.68	4189	1
41	94370.477	1604	285289.11	4431	1	302307.59	4182	1
40	94360.851	1605	285023.49	4424	1	302056.93	4175	1
39	94351.216	1606	284758.31	4417	1	301806.71	4167	1
38	94341.574	1608	284493.56	4409	1	301556.94	4160	1
37	94331.924	1609	284229.26	4402	1	301307.60	4153	1
36	94322.266	1610	283965.39	4495	1	301058.70	4145	1
35	94312.600	1612	283701.96	4388	1	300810.24	4138	1
34	94302.925	1613	283438.96	4380	1	300562.21	4131	1
33	94293.243	1614	283176.39	4373	1	300314.62	4124	1
32	94283.553	1616	282914.26	4366	1	300067.46	4116	1
31	94273.855	1617	282652.56	4359	1	299820.71	4110	1
30	94264.149	1618	282391.29	4352	1	299574.43	4102	1

19. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	33408.10	457	35444.60	546	106095.803	1823
32	33435.52	457	35477.34	546	106106.748	1825
33	33462.93	457	35510.10	546	106117.704	1827
34	33490.34	457	35542.86	546	106128.671	1829
35	33517.75	457	35575.62	546	106139.649	1831
36	33545.16	457	35608.40	546	106150.638	1833
37	33572.56	457	35641.18	546	106167.639	1835
38	33599.96	457	35673.97	546	106172.651	1836
39	33627.35	457	35706.76	547	106183.674	1838
40	33654.75	457	35739.56	547	106194.709	1840
41	33682.14	456	35772.37	547	106205.755	1842
42	33709.53	456	35805.18	547	106216.812	1844
43	33736.91	456	35838.00	547	106227.881	1846
44	33764.29	456	35870.83	547	106238.960	1848
45	33791.67	456	35903.67	547	106250.051	1850
46	33819.05	456	35936.51	547	106261.154	1851
47	33846.42	456	35969.36	547	106272.267	1853
48	33873.79	456	36002.21	548	106283.392	1855
49	33901.16	456	36035.08	548	106294.529	1857
50	33928.52	456	36067.95	548	106305.676	1859
51	33955.89	456	36100.82	548	106316.835	1861
52	33983.24	466	36133.71	548	106328.006	1863
53	34010.60	456	36166.60	548	106339.187	1865
54	34037.95	456	36199.49	548	106350.380	1867
55	34065.30	456	36232.40	548	106361.585	1868
56	34092.65	456	36265.31	549	106372.801	1870
57	34120.00	456	36298.23	549	106384 028	1872
58	34147.34	456	36331.15	549	106395.266	1874
59	34174.68	456	36364.08	549	106406.516	1876
60	34202.01	456	36397.02	549	106417.777	1878

70. Grad.

maPu	Sinus	10″	Tangens	10″	In	Secans	10″	In
29	94254.435	1620	282130.45	4344	1	299328.56	4095	1
28	94244.713	1621	281870.03	4337	1	299083.12	4088	1
27	94234.983	1622	281610.04	4330	1	298838.11	4081	1
26	94225.245	1624	281350.48	4323	1	298593.52	4073	1
25	94215.499	1625	281091.34	4316	1	298349.36	4066	1
24	94205.745	1626	280832.63	4309	1	298105.63	4050	1
23	94195.983	1628	280574.33	4302	1	297862.31	4052	1
22	94186.214	1629	280316.46	4295	1	297619.42	4045	1
21	94176.436	1630	280059.01	4288	1	297376.95	4038	1
20	94166.650	1632	279801.98	4281	1	297134.90	4031	1
19	94156.856	1633	279545.37	4274	1	296893.27	4024	1
18	94147.054	1634	279287.17	4267	1	296652.02	4017	1
17	94137.245	1635	279033.39	4260	1	296411.25	4010	2
16	94127.427	1637	278778.02	4253	1	296170.87	4003	1
15	94117.602	1638	278523.07	4246	1	295930.90	3997	1
14	94107.768	1639	278268.53	4239	1	295691.35	3990	1
13	94097.926	1641	278014.40	4233	1	295452.21	3983	1
12	94088.077	1642	277760.68	4226	1	295213.48	3976	1
11	94078.219	1643	277507.38	4219	1	294975.16	3969	1
10	94068.354	1645	277254.48	4212	1	294737.25	3962	1
9	94058.481	1646	277001.99	4205	1	294499.75	3956	1
8	94048.599	1647	276749.90	4199	1	294262.65	3940	1
7	94038.710	1649	276498.22	4192	1	294025.96	3942	1
6	94028.813	1650	276246.95	4185	1	293789.68	3935	1
5	94018.907	1651	275996.08	4178	1	293553.80	3928	1
4	94008.994	1653	275745.61	4172	1	293318.33	3923	1
3	93990.073	1654	275495.54	4165	1	293083.26	3915	1
2	93989.144	1655	275245.88	4158	1	292848.58	3908	1
1	93979.207	1657	274996.61	4152	1	292614.31	3903	1
0	93969.262	1658	274747.74	4145	1	292380.44	3895	1

20. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	34229.35	456	36429.97	549	106429.050	1889
2	34256.68	455	36462.92	549	106440.334	1882
3	34284.00	455	36495.88	549	106451.629	1884
4	34311.33	455	36528.85	549	106462.936	1886
5	34338.65	455	36561.82	550	106474.254	1887
6	34365.97	455	36594.80	550	106485.584	1889
7	34393.28	455	36627.79	550	106496.925	1891
8	34420.60	455	36660.79	550	106508.278	1893
9	34447.91	455	36693.79	550	106519.642	1895
10	34475.21	455	36726.80	550	106531.017	1897
11	34502.52	455	36759.81	550	106542.404	1899
12	34529.82	455	36792.84	550	106553.802	1901
13	34557.12	455	36825.87	551	106565.212	1903
14	34584.41	455	36858.90	551	106576.633	1905
15	34611.71	455	36891.95	551	106588.066	1907
16	34638.99	455	36925.00	551	106599.510	1908
17	34666.28	455	36958.06	551	106610.966	1910
18	34693.56	455	36991.12	551	106622.432	1912
19	34720.85	455	37024.20	551	106633.912	1914
20	34748.12	455	37057.28	551	106645.402	1916
21	34775.40	455	37090.36	551	106656.903	1918
22	34802.67	454	37123.46	552	106668.416	1920
23	34829.94	454	37156.56	552	106679.941	1922
24	34857.20	454	37189.67	552	106691.477	1924
25	34884.47	454	37222.78	552	106703.025	1926
26	34911.73	454	37255.90	552	106714.584	1928
27	34938.98	454	37289.03	552	106726.155	1930
28	34966.24	454	37322.17	552	106737.737	1931
29	34993.49	454	37355.32	552	106749.331	1933
30	35020.74	454	37388.47	553	106760.936	1935

69.Grad.

Prima	Sinus	10″	Tangens	10′	In	Secans	10″	In
59	93959.309	1659	274499.27	4138	1	292146.97	3888	1
58	93949.348	1661	274251.20	4132	1	291913.89	3882	1
57	93939.379	1662	274003.52	4125	1	291681.21	3875	1
56	93929.423	1663	273756.23	4119	1	291448.91	3869	1
55	93919.418	1665	273509.34	4112	1	291217.03	3862	1
54	93909.425	1666	273262.84	4106	1	290985.53	3856	1
53	93899.425	1667	273016.74	4099	1	290754.43	3849	1
52	93889.416	1669	272771.02	4093	1	290523.72	3843	1
51	93879.399	1670	272525.69	4086	1	290293.39	3836	1
50	93869.375	1671	272280.75	4080	1	290063.46	3830	1
49	93859.343	1673	272036.20	4073	1	289833.91	3823	1
48	93849.302	1674	271792.04	4067	1	289604.75	3817	1
47	93839.254	1675	271548.26	4060	1	289375.98	3810	1
46	93829.198	1677	271304.87	4054	1	289147.60	3804	1
45	93819.134	1678	271061.86	4047	1	288919.59	3797	1
44	93809.061	1679	270819.23	4041	1	288691.98	3791	1
43	93798.981	1681	270576.99	4035	1	288464.74	3785	1
42	93788.893	1682	270335.13	4028	1	288237.89	3778	1
41	93778.798	1683	270093.64	4022	1	288011.42	3772	1
40	93768.694	1685	269852.54	4016	1	287785.32	3766	1
39	93758.582	1686	269611.81	4009	1	287559.61	3759	1
38	93748.462	1687	269371.47	4003	1	287334.28	3753	1
37	93738.330	1688	269131.49	3997	1	287109.32	3747	1
36	93728.199	1690	268891.90	3991	1	286884.74	3740	1
35	93718.055	1691	268652.67	3984	1	286660.53	3734	1
34	93707.904	1692	268413.83	3978	1	286436.70	3728	1
33	93697.745	1694	268175.35	3972	1	286213.24	3722	1
32	93687.577	1695	267937.25	3966	1	285990.15	3716	1
31	93677.402	1696	267699.51	3960	1	285767.44	3709	1
30	93667.219	1698	267462.15	3960	1	285545.09	3703	1

20. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	35047.98	454	37421.63	553	106772.553	1937
32	35075.23	454	37458.79	553	106784.182	1939
33	35102.46	454	37487.97	553	106795.822	1941
34	35129.70	454	37521.15	553	106807.474	1943
35	35156.93	454	37554.33	553	106819.137	1945
36	35184.16	454	37587.53	553	106830.812	1947
37	35211.39	454	37620.73	553	106842.498	1949
38	35238.62	454	37653.94	554	106854.196	1951
39	35265.84	454	37687.16	554	106865.906	1953
40	35293.06	454	37720.38	554	106877.627	1955
41	35320.27	454	37753.61	554	106889.360	1957
42	35347.48	454	37786.85	554	106901.104	1959
43	35374.69	453	37820.10	554	106912.860	1960
44	35401.90	453	37853.35	554	106924.628	1962
45	35429.10	453	37886.61	554	106936.408	1964
46	35456.30	453	37919.88	554	106948.199	1966
47	35483.50	453	37953.15	555	106960.001	1968
48	35510.70	453	37986.44	555	106971.816	1970
49	35537.89	453	38019.73	555	106983.642	1972
50	35565.08	453	38053.02	555	106995.479	1974
51	35592.26	453	38086.33	555	107007.329	1976
52	35619.44	453	38119.64	555	107019.190	1978
53	35646.62	453	38152.96	555	107031.063	1980
54	35673.80	453	38180.29	555	107042.947	1982
55	35700.97	453	38219.62	556	107054.843	1984
56	35728.14	453	38252.96	556	107066.751	1986
57	35755.31	453	38286.31	556	107078.670	1988
58	35782.47	453	38319.67	556	107090.603	1990
59	35809.64	453	38353.03	556	107102.545	1992
60	35836.79	453	38386.40	556	107114.509	1994

69. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	93657.028	1699	267225.15	3947	1	285323.12	3697	1
28	93646.829	1700	266988.53	3941	1	285101.52	3691	1
27	93636.622	1702	266752.27	3935	1	284880.28	3685	1
26	93626.407	1703	266516.38	3929	1	284659.41	3679	1
25	93616.184	1704	266280.85	3923	1	284438.91	3673	1
24	93605.954	1706	266045.69	3917	1	284218.77	3666	1
23	93595.715	1707	265810.89	3911	1	283998.99	3660	1
22	93585.468	1708	265576.45	3905	1	283779.58	3654	1
21	93575.214	1710	265342.38	3899	1	283560.54	3648	1
20	93564.952	1711	265108.67	3893	1	283341.85	3642	1
19	93554.682	1712	264875.31	3887	1	283123.53	3636	1
18	93544.483	1714	264642.32	3881	1	282905.56	3630	1
17	93534.117	1715	264409.69	3875	1	282687.96	3624	1
16	93523.823	1716	264177.41	3869	1	282470.71	3618	1
15	93513.521	1718	263945.49	3863	1	282253.82	3612	1
14	93503.211	1719	263713.92	3857	1	282037.29	3606	1
13	93492.893	1720	263482.71	3851	1	281821.11	3600	1
12	93482.568	1721	263251.86	3845	1	281605.29	3595	1
11	93472.234	1723	263021.30	3839	1	281389.82	3589	1
10	93461.893	1724	262791.21	3833	1	281174.71	3583	1
9	93451.543	1725	262561.41	3828	1	280959.95	3577	1
8	93441.186	1727	262331.96	3822	1	280745.54	3571	1
7	93430.821	1728	262102.86	3816	1	280531.48	3565	1
6	93420.447	1729	261874.11	3810	1	280317.77	3559	1
5	93410.066	1731	261645.71	3804	1	280104.41	3554	1
4	93399.677	1732	261417.66	3798	1	279891.40	3548	1
3	93389.281	1733	261189.95	3793	1	279678 73	3542	1
2	93378.876	1735	260962.59	3787	1	279466.41	3536	1
1	93368.463	1736	260735.58	3781	1	279254.44	3530	1
0	93358.045	1737	260508.91	3777	1	279042.81	3525	1

21. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	35863.95	453	38419.78	556	107126.466	1996
2	35891.10	452	38453.17	556	107138.444	1997
3	35918.25	452	38486.56	557	107150.433	1999
4	35945.40	452	38519.96	557	107162.436	2001
5	35972.54	452	38553.37	557	107174.450	2003
6	35999.68	452	38586.79	557	107186.474	2005
7	36026.82	452	38620.21	557	107198.511	2007
8	36053.95	452	38653.64	557	107210.560	2009
9	36081.08	452	38687.08	557	107222.620	2011
10	36108.21	452	38720.53	557	107234.693	2013
11	36135.33	452	38753.98	558	107246.777	2015
12	36162.46	452	38787.44	558	107258.873	2017
13	36189.58	452	38820.91	558	107270.980	2019
14	36217.69	452	38854.39	558	107283.100	2021
15	36243.80	452	38887.87	558	107295.231	2023
16	36270.91	452	38921.36	558	107307.375	2025
17	36298.02	452	38954.86	558	107319.530	2027
18	36325.12	452	38988.37	558	107331.696	2029
19	36352.22	452	39021.88	559	107343.875	2031
20	36379.32	452	39055.41	559	107356.066	2033
21	36406.41	452	39088.94	559	107368.268	2035
22	36433.51	451	39122.47	559	107380.482	2037
23	36460.59	451	39156.02	559	107392.708	2039
24	36487.68	451	39189.57	559	107404.946	2041
25	36514.76	451	39223.13	559	107417.196	2043
26	36541.84	451	39256.70	559	107429.458	2045
27	36568.91	451	39290.27	559	107441.737	2047
28	36595.99	451	39323.86	560	107454.017	2049
29	36623.06	451	39357.45	560	107466.315	2051
30	36650.12	451	39391.05	560	107478.624	2053

68. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
59	93347.614	1739	260282.58	3770	1	278831.53	3519	1
58	93337.178	1740	260056.59	3764	1	278620.59	3513	1
57	93326.734	1741	259830.95	3758	1	278409.99	3508	1
56	93316.281	1743	259605.64	3753	1	278199.73	3502	1
55	93305.821	1744	259380.68	3747	1	277989.82	3496	1
54	93295.353	1745	259156.06	3741	1	277780.24	3491	1
53	93284.878	1747	258931.77	3736	1	277571.00	3485	1
52	93274.394	1748	258707.82	3730	1	277362.11	3479	1
51	93263.902	1749	258484.21	3725	1	277153.55	3474	1
50	93253.403	1750	258266.04	3719	1	276945.32	3468	1
49	93242.895	1752	258038.00	3713	1	276737.43	3462	1
48	93232.380	1753	257815.39	3708	1	276529.88	3457	1
47	93221.857	1754	257593.12	3702	1	276322.66	3451	1
46	93211.326	1756	257371.18	3697	1	276115.78	3446	1
45	93200.787	1757	257149.57	3691	1	275909.23	3440	1
44	93190.240	1758	256928.30	3686	1	275703.01	3435	1
43	93179.685	1760	256707.35	3680	1	275497.12	3439	1
42	93169.123	1761	256486.74	3675	1	275291.57	3424	1
41	93158.552	1762	256266.45	3669	1	275086.34	3418	1
40	93147.974	1764	256046.49	3664	1	274881.44	3413	1
39	93137.388	1765	255826.86	3658	1	274676.87	3407	1
38	93126.793	1766	255607.56	3653	1	274472.63	3402	1
37	93116.191	1768	255388.58	3647	1	274268.71	3396	1
36	93105.582	1769	255169.92	3642	1	274065.12	3391	1
35	93094.964	1770	254951.60	3637	1	273861.86	3385	1
34	93084.338	1771	254733.59	3631	1	273658.92	3380	1
33	93073.705	1773	254515.91	3626	1	273456.30	3375	1
32	93063.063	1774	254298.55	3620	1	273254.00	3369	1
31	93052.414	1775	254081.51	3615	1	273052.03	3364	1
30	93041.757	1777	253864.79	3601	1	272850.38	3354	1

21. Grad.

Prim.	Sinus	10″	Tangens	10″	Secans	10″
31	36677.19	451	39424.65	560	107490.945	2055
32	36704.25	451	39458.27	560	107503.279	2057
33	36731.30	451	39491.89	560	107515.624	2059
34	36758.36	451	39525.52	561	107527.980	2061
35	36785.41	451	39559.16	561	107540.350	2063
36	36812.45	451	39592.80	561	107552.731	2065
37	36839.50	451	39626.45	561	107565.124	2067
38	36866.54	451	39660.11	561	107577.529	2069
39	36893.58	451	39693.78	561	107589.945	2071
40	36920.61	451	39727.46	561	107602.374	2073
41	36947.65	450	39761.14	561	107614.815	2075
42	36974.68	450	39794.83	562	107627.268	2077
43	37001.70	450	39828.53	562	107639.732	2079
44	37028.72	450	39862.24	562	107652.209	2081
45	37055.74	450	39895.95	562	107664.698	2083
46	37082.76	450	39929.68	562	107677.199	2085
47	37109.77	450	39963.41	562	107689.712	2087
48	37136.78	450	39997.15	562	107702.236	2089
49	37163.79	450	40030.89	562	107714.773	2091
50	37190.79	450	40064.65	563	107727.322	2093
51	37217.79	450	40098.41	563	107739.883	2095
52	37244.79	450	40132.18	563	107752.456	2097
53	37271.79	450	40165.96	563	107765.041	2099
54	37298.78	450	40199.74	563	107777.638	2101
55	37325.77	450	40233.54	563	107790.247	2103
56	37352.75	450	40267.34	563	107802.868	2105
57	37379.73	450	40301.15	564	107815.502	2107
58	37406.71	450	40334.96	564	107828.147	2109
59	37433.69	450	40368.79	564	107840.845	2111
60	37460.66	450	40402.62	564	107853.474	2113

68. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	93031.092	1778	253648.39	3604	1	272649.05	3353	1
28	93024.189	1779	253432.31	3599	1	272448.04	3348	1
27	93009.738	1781	253216.55	3594	1	272247.35	3343	1
26	92999.049	1782	253001.11	3589	1	272046.95	3337	1
25	92988.353	1783	252785.98	3583	1	271846.93	3332	1
24	92977.649	1785	252571.17	3578	1	271647.19	3327	1
23	92966.936	1786	252356.67	3573	1	271447.77	3321	1
22	92956.216	1785	252142.49	3567	1	271248.66	3316	1
21	92945.488	1789	251928.63	3562	1	271049.87	3311	1
20	92934.752	1790	251715.07	3557	1	270851.39	3306	1
19	92924.009	1791	251501.83	3552	1	270653.23	3301	1
18	92913.257	1792	251288.90	3547	1	270455.38	3295	1
17	92902.498	1794	251076.28	3541	1	270257.84	3290	1
16	92891.730	1795	250863.98	3536	1	270060.61	3285	1
15	92880.955	1796	250651.98	3531	1	269863.70	3280	1
14	92870.172	1798	250440.29	3526	1	269667.09	3275	1
13	92859.381	1799	250228.91	3520	1	269470.79	3270	1
12	92848.583	18[illegible]	250017.84	3516	1	269274.80	3264	1
11	92837.776	1802	249807.07	3511	1	269579.12	3259	1
10	92826.962	1803	249596.61	3506	1	268883.74	3254	1
9	92816.139	1804	249386.45	3500	1	268688.67	3249	1
8	92805.309	1806	249176.60	3495	1	268493.91	3244	1
7	92794.471	1807	248967.06	3490	1	268299.45	3239	1
6	92783.625	1808	248757.81	3485	1	268105.30	3234	1
5	92772.772	1809	248548.87	3480	1	267911.44	3229	1
4	92761.916	1811	248340.23	3475	1	267717.90	3224	1
3	92751.041	1812	248131.90	3470	1	267524.65	3219	1
2	92740.163	1813	247923.86	3465	1	267331.70	3214	1
1	92729.278	1815	247716.12	3460	1	267139.06	3209	1
0	92718.385	1816	247508 68	3455	1	266946.72	3204	1

22. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	37487.63	449	40436.46	564	107866.166	2115
2	37514.59	449	40470.31	564	107878.850	2117
3	37541.56	449	40504.17	564	107891.556	2119
4	37568.52	449	40538.03	564	107904.274	2121
5	37595.47	449	40571.91	565	107917.004	2123
6	37622.43	449	40605.79	565	107929.746	2125
7	37649.38	449	40639.68	565	107942.501	2127
8	37676.32	449	40673.57	565	107955.267	2129
9	37703.27	449	40707.48	565	107968.046	2131
10	37730.21	449	40741.39	565	107980.837	2133
11	37757.14	449	40775.31	565	107993.640	2135
12	37784.08	449	40809.24	566	108006.455	2137
13	37811.01	449	40843.18	566	108019.283	2139
14	37837.94	449	40877.13	566	108032.122	2141
15	37864.86	449	40911.08	566	108044.974	2143
16	37891.78	449	40945.04	566	108057.838	2145
17	37918.70	449	40979.01	566	108070.715	2147
18	37945.62	449	41012.99	566	108083.603	2149
19	37972.53	448	41046.97	566	108096.504	2151
20	37999.44	448	41080.97	567	108109.417	2153
21	38026.34	448	41114.97	567	108122.342	2155
22	38053.24	448	41148.98	567	108135.279	2157
23	38080.14	448	41183.00	567	108148.229	2159
24	38107.04	448	41217.03	567	108161.191	2161
25	38133.93	448	41251.06	567	108174.165	2164
26	38160.82	448	41285.10	567	108187.151	2166
27	38187.70	448	41319.15	568	108200.150	2168
28	38214.59	448	41353.21	568	108213.161	2170
29	38241.47	448	41387.28	568	108226.184	2172
30	38268.34	448	41421.36	568	108239.220	2174

67.Grad.

Prima	Sinus	10″	Tangens	10′	In	Secans	10″	In
59	92707.485	1817	247301.55	3450	1	266754.67	3199	1
58	92696.576	1819	247094.70	3445	1	266562.92	3194	1
57	92685.660	1820	246888.16	3440	1	266371.48	3189	1
56	92674.735	1821	246681.91	3435	1	266180.32	3184	1
55	92668.803	1823	246475.96	3430	1	265989.47	3179	1
54	92654.863	1824	246570.30	3426	1	265798.91	3174	1
53	92641.915	1825	246064.94	3421	1	265608.65	3169	1
52	92630.960	1826	245859.87	3416	1	265418.68	3164	1
51	92619.996	1828	245655.09	3411	1	265229.01	3159	1
50	92609.025	1829	245450.61	3406	1	265039.62	3154	1
49	92598.045	1830	245246.42	3401	1	264850.54	3149	1
48	92587.058	1832	245042.52	3396	1	264661.74	3145	1
47	92576.064	1833	244838.91	3391	1	264473.23	3140	1
46	92565.061	1834	244635.59	3387	1	264285.02	3135	1
45	92554.050	1836	244432.56	3382	1	264097.09	3130	1
44	92543.032	1837	244229.82	3377	1	263909.46	3125	1
43	92532.006	1838	244027.36	3372	1	263722.11	3120	1
42	92520.972	1840	243825.19	3367	1	263535.05	3116	1
41	92509.930	1841	243623.31	3363	1	263348.28	3111	1
40	92498.880	1842	243421.72	3358	1	263161.80	3106	1
39	92487.823	1843	243220.41	3353	1	262975.60	3101	1
38	92476.757	1845	243019.38	3348	1	262789.69	3097	1
37	92465.684	1846	242818.64	3344	1	262604.06	3092	1
36	92454.603	1847	242618.19	3339	1	262418.72	3087	1
35	92443.515	1849	242418.01	3334	1	262233.66	3082	1
34	92432.418	1850	242218.12	3330	1	262048.88	3078	1
33	92421.313	1851	242018.51	3325	1	261864.39	3073	1
32	92410.201	1853	241819.18	3320	1	261680.18	3068	1
31	92399.081	1854	241620.13	3316	1	261496.24	3064	1
30	92387.953	1855	241421.36	3311	1	261312.59	3059	1

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22. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	38295.22	448	41455.44	568	108252.268	2176
32	38322.09	448	41489.53	568	108265.328	2176
33	38348.95	448	41523.63	568	108278.401	2178
34	38375.82	448	41557.74	569	108291.485	2182
35	38402.67	448	41591.86	569	108304.583	2184
36	38429.53	448	41625.98	569	108317.692	2186
37	38456.39	447	41660.12	569	108330.814	2188
38	38483.24	447	41694.26	569	108343.948	2190
39	38510.08	447	41728.41	569	108357.095	2192
40	38536.93	447	41762.56	569	108370.253	2194
41	38563.77	447	41796.73	569	108383.425	2196
42	38590.60	447	41830.91	570	108396.608	2198
43	38677.44	447	41865.09	570	108409.804	2201
44	38644.27	447	41899.28	570	108423.013	2203
45	38671.10	447	41933.48	570	108436.234	2205
46	38697.92	447	41967.69	570	108449.467	2206
47	38724.74	447	42001.90	570	108462.712	2209
48	38751.56	447	42036.13	570	108475.970	2211
49	38778.37	447	42070.36	571	108489.241	2213
50	38805.18	447	42104.60	571	108502.524	2215
51	38831.99	447	42138.85	571	108515.819	2217
52	38858.80	447	42173.11	571	108529.127	2219
53	38885.60	447	42207.38	571	108542.447	2221
54	38912.39	447	42241.65	571	108555.780	2223
55	38939.19	447	42275.94	571	108569.125	2225
56	38965.98	446	42310.23	571	108582.482	2227
57	38992.77	446	42344.53	572	108595.853	2230
58	39019.51	446	42378.84	572	108609.235	2232
59	39046.33	446	42423.16	572	108622.630	2234
60	39073.11	446	42447.48	572	108636.038	2236

67. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	92376.818	1856	241222.86	3306	1	261129.22	3054	1
28	92365.674	1858	241024.65	3302	1	261946.13	3050	1
27	92354.523	1859	240826.72	3297	1	260763.32	3045	1
26	92343.363	1860	240629.06	3292	1	260580 78	3042	1
25	92332.196	1862	240431.68	3288	1	260398.52	3036	1
24	92321.022	1863	240234.57	3283	1	260216.54	3031	1
23	92309.839	1864	240037.74	3279	1	260034.84	3026	1
22	92298.949	1866	239841.18	3274	1	259853.41	3022	1
21	92287.450	1867	239644.90	3269	1	259672.25	3017	1
20	92276.244	1868	239448.89	3265	1	259491.37	3013	1
19	92265.031	1870	239253.16	3260	1	259310.77	3008	1
18	92253.809	1871	239057.69	3256	1	259130.43	3004	1
17	92242.580	1872	238862.50	3251	1	258950.37	2999	2
16	92231.342	1873	238667.58	3247	1	258770.58	2995	1
15	92220.097	1875	238472.93	3242	1	258591.07	2990	1
14	92220.974	1876	238278.55	3238	1	258411.82	2986	1
13	92197.584	1877	238084.44	3233	1	258232.84	2981	1
12	92186.315	1879	237890.60	3229	1	258054.14	2977	1
11	92175.039	1880	237697.02	3224	1	257875.70	2972	1
10	92163.755	1881	237503.72	3220	1	257697.53	2968	1
9	92152.463	1882	237310.68	3215	1	257519.63	2963	1
8	92141.163	1884	237117.91	3211	1	257341.99	2959	1
7	92129.856	1885	236925.40	3207	1	257164.62	2954	1
6	92118.541	1886	236733.16	3202	1	256987.52	2950	1
5	92107.217	1888	236541.18	3199	1	256810.69	2945	1
4	92095.887	1889	236349.46	3193	1	256634.12	2941	1
3	92084.548	1890	236158.01	3189	1	256457.37	2937	1
2	92073.202	1892	235966.83	3185	1	256281.76	2932	1
1	92061.847	1893	235775.90	3180	1	256105.99	2928	1
0	92050.485	1894	235585.24	3176	1	255930.47	2923	1

23. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	39099.89	446	42481.82	572	108649.458	2238
2	39126.66	446	42516.16	572	108662.890	2240
3	39153.43	446	42550.51	573	108676.335	2242
4	39180.19	446	42584.87	573	108689.793	2244
5	39206.95	446	42619.24	573	108703.263	2246
6	39233.71	446	42653.61	573	108716.746	2248
7	39260.47	446	42688.00	573	108730.241	2250
8	39287.22	446	42722.39	573	108743.749	2253
9	39313.97	446	42756.80	573	108757.269	2255
10	39340.71	446	42791.21	574	108770.802	2257
11	39367.45	446	42825.63	574	108784.348	2259
12	39394.19	446	42860.05	574	108797.906	2261
13	39420.93	446	42894.49	574	108811.476	2263
14	39447.66	445	42928.94	574	108825.060	2265
15	39474.39	445	42963.39	574	108838.655	2267
16	39501.11	445	42997.85	574	108852.264	2269
17	39527.83	445	43032.32	575	108865.885	2271
18	39554.55	445	43066.80	575	108879.519	2273
19	39581.26	445	43101.29	575	108893.165	2276
20	39607.98	445	43135.79	575	108906.824	2278
21	39634.68	445	43170.29	575	108920.496	2280
22	39661.39	445	43204.81	575	108934.180	2282
23	39688.09	445	43239.33	575	108947.877	2284
24	39714.79	445	43273.86	576	108961.586	2286
25	39741.48	445	43308.40	576	108975.309	2288
26	39768.17	445	43342.95	576	108989.044	2290
27	39794.86	445	43377.51	576	109002.791	2292
28	39821.55	445	43412.08	576	109016.552	2295
29	39848.23	445	43446.65	576	109030.325	2297
30	39874.91	445	43481.24	576	109044.110	2299

66.Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
59	92039.116	1895	235394.83	3172	1	255755.21	2919	1
58	92027.738	1898	235204.69	3167	1	255580.22	2915	1
57	92016.353	1898	235014.81	3163	1	255405.48	2910	1
56	92004.959	1899	234825.19	3159	1	255231.01	2906	1
55	91993.558	1901	234635.82	3154	1	255056.80	2902	1
54	91982.150	1902	234446.72	3150	1	254882.84	2897	1
53	91970.733	1903	234257.87	3146	1	254709.15	2893	1
52	91959.309	1905	234069.28	3141	1	254535.71	2889	1
51	91947.877	1906	233880.95	3137	1	254362.53	2885	1
50	91936.437	1907	233692.87	3133	1	254189.61	2880	1
49	91924.989	1908	233505.05	3129	1	254016.94	2876	1
48	91913.534	1910	233317.48	3124	1	253844.53	2872	1
47	91902.071	1911	233130.17	3120	1	253672.38	2867	1
46	91890.600	1912	232943.11	3116	1	253500.48	2863	1
45	91879.121	1914	232756.30	3112	1	253328.83	2859	1
44	91867.634	1915	232569.75	3107	1	253157.44	2855	1
43	91856.140	1916	232383.45	3103	1	252986.30	2851	1
42	91844.638	1918	232197.40	3099	1	252815.41	2846	1
41	91833.128	1919	232011.60	3095	1	252644.78	2842	1
40	91821.611	1920	231826.06	3091	1	252474.40	2838	1
39	91810.085	1921	231640.76	3087	1	252304.26	2834	1
38	91798.552	1923	231455.71	3082	1	252134.38	2830	1
37	91787.011	1924	231270.91	3078	1	251964.75	2825	1
36	91775.463	1925	231086.36	3074	1	251795.37	2821	1
35	91763.906	1927	230902.06	3070	1	251626.24	2817	1
34	91752.342	1928	230718.01	3067	1	251457.35	2813	1
33	91740.770	1929	230534.20	3062	1	251288.71	2809	1
32	91729.190	1930	230350.64	3058	1	251120.32	2805	1
31	91717.603	1932	230167.32	3054	1	250952.18	2801	1
30	91706.007	1833	229984.25	3049	1	250784.28	2797	1

23. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	39901.58	445	43515.83	577	109057.909	2301
32	39928.25	444	43550.43	577	109071.720	2303
33	39954.92	444	43585.04	577	109085.544	2305
34	39981.58	444	43619.66	577	109099.381	2307
35	40008.25	444	43654.29	577	109113.230	2309
36	40034.90	444	43688.93	577	109127.092	2312
37	40061.56	444	43723.57	577	109140.967	2314
38	40088.21	444	43758.22	578	109154.855	2316
39	40114.86	444	43792.89	578	109168.755	2318
40	40141.50	444	43827.56	578	109182.668	2320
41	40168.14	444	43862.24	578	109196.594	2322
42	40194.78	444	43896.93	578	109210.533	2324
43	40221.41	444	43931.63	578	109224.485	2326
44	40248.04	444	43966.34	578	109238.449	2329
45	40274.67	444	44001.05	579	109252.416	2331
46	40301.29	444	44035.78	579	109266.416	2333
47	40327.91	444	44070.51	579	109280.419	2335
48	40354.53	444	44105.25	579	109294.435	2337
49	40381.14	444	44140.01	579	109308.464	2339
50	40407.75	443	44174.77	579	109322.505	2341
51	40434.36	443	44209.54	580	109336.559	2344
52	40460.96	443	44244.32	580	109350.626	2346
53	40487.56	443	44279.10	580	109364.707	2348
54	40514.16	443	44313.90	580	109378.799	2350
55	40540.75	443	44348.71	580	109392.905	2352
56	40567.34	443	44383.52	580	109407.024	2354
57	40593.93	443	44418.34	580	109421.156	2356
58	40620.51	443	44453.18	581	109435.300	2359
59	40647.09	443	44488.02	581	109449.457	2361
60	40673.66	443	44522.87	581	109463.628	2363

66. Grad.

Prima	Sinus	10″	Tangens	10″	In	Secans	10″	In
29	91694.404	1934	229801.43	3045	1	250616.63	2792	1
28	91682.794	1936	229618.85	3041	1	250449.23	2788	1
27	91671.175	1937	229436 51	3037	1	250282.07	2785	1
26	91659.549	1938	229254.42	3033	1	250115.15	2780	1
25	91647.915	1940	229072.57	3029	1	249948.47	2776	1
24	91636.273	1941	228890.96	3025	1	249782.04	2772	1
23	91624.623	1942	228790.59	3021	1	249615.86	2768	1
22	91612.966	1943	228528.46	3017	1	249449.91	2764	1
21	91601.301	1945	228347.58	3013	1	249284.21	2760	1
20	91589.628	1946	228166.93	3009	1	249118.74	2756	1
19	91577.948	1947	227986.52	3005	1	248953.52	2752	1
18	91566.259	1949	227806.36	3001	1	248788.54	2748	1
17	91554.563	1950	227626.43	2997	1	248623.80	2744	1
16	91542.659	1951	227449.74	2993	1	248459.29	2740	1
15	91531.148	1952	227267.29	2989	1	248295.03	2736	1
14	91519.429	1954	227088.07	2985	1	248131.00	2732	1
13	91507.702	1955	226909.09	2981	1	247967.21	2728	1
12	91495.967	1956	226730.35	2977	1	247803.66	2724	1
11	91484.224	1958	226551.84	2973	1	247640.34	2720	1
10	91472.474	1959	226373.57	2970	1	247477.26	2716	1
9	91460.716	1960	226195.53	2966	1	247314.42	2712	1
8	91448.950	1961	226017.73	2962	1	247151.81	2709	1
7	91437.177	1963	225840.16	2958	1	246989.43	2705	1
6	91425.396	1964	225662.83	2954	1	246827.29	2701	1
5	91413.607	1965	225485.72	2950	1	246665.38	2697	1
4	91401.810	1967	225308.85	2946	1	246503.71	2693	1
3	91390.005	1968	225132.21	2942	1	246342.27	2689	1
2	91378.193	1969	224955.80	2939	1	246181.06	2685	1
1	91366.373	1971	224779.62	2934	1	246020.08	2681	1
0	91354.555	1972	224603.68	2931	1	245859.33	2677	1

24. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	40700.24	443	44557.73	581.4	109477.811	2365
2	40726.80	443	44592.60	581.2	109492.007	2367
3	40753.37	443	44627.47	581.4	109506.217	2369
4	40779.93	443	44662.36	581.5	109520.439	2372
5	40806.49	443	44697.26	582.7	109534.674	2374
6	40833.05	443	44732.16	582.8	109548.922	2276
7	40859.60	442	44767.08	582.0	109563.183	2378
8	40886.15	442	44802.00	582.1	109577.457	2380
9	40912.69	442	44836.93	582.3	109591.744	2382
10	40939.23	442	44871.87	582.4	109606.044	2385
11	40965.77	442	44906.82	583.6	109620.357	2387
12	40992.30	442	44941.78	583.8	109634.683	2389
13	41018.83	442	44976.75	583.9	109649.022	2391
14	41045.36	442	45011.73	583.1	109663.374	2393
15	41071.88	442	45046.71	583.2	109677.740	2395
16	41098.41	442	45081.71	583.4	109692.118	2398
17	41124.92	442	45116.72	583.5	109706.509	2400
18	41151.44	442	45151.73	584.7	109720.913	2402
19	41177.95	442	45186.75	584.8	109735.331	2404
20	41204.45	442	45221.79	584.0	109749.761	2406
21	41230.95	442	45256.83	584.1	109764.205	2409
22	41257.45	442	45291.88	584.3	109778.661	2411
23	41283.95	442	45326.94	584.4	109793.131	2413
24	41310.44	441	45362.01	585.6	109807.614	2415
25	41336.93	441	45397.09	585.7	109822.110	2417
26	41363.42	441	45432.18	585.9	109836.619	2419
27	41389.90	441	45467.28	585.0	109851.141	2422
28	41416.38	441	45502.38	585.2	109865.677	2424
29	41442.85	441	45537.50	585.4	109880.225	2426
30	41469.32	441	45572.62	585.5	109894.787	2428

65. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	I
59	91342.710	1973	224427.96	2927	1	245698.82	2674	1
58	91330.867	1974	224252.47	2923	1	245538.53	2670	1
57	91319.017	[illegible]	224077.21	2919	1	245378.48	2666	1
56	91307.158	[illegible]	223902.18	2916	1	245218.65	2662	1
55	91295.292	1978	223727.38	2912	1	245059.05	2658	1
54	91283.418	[illegible]	223552.80	2908	1	244899.68	2655	1
53	91271.536	1981	223378.45	2904	1	244740.54	2651	1
52	91259.647	1982	223204.33	2900	1	244581.63	2647	1
51	91247.749	1983	223030.43	[illegible]	1	244422.94	2644	1
50	91235.845	1985	222856.76	2893	1	244264.48	2639	1
49	91223.932	1986	222683.31	2889	1	244106.24	2636	1
48	91212.012	1987	222510.09	2885	1	243948.23	2632	1
47	91200.084	1989	222337.09	2882	1	243790.45	2628	1
46	91188.148	[illegible]	222164.32	2878	1	243632.89	2624	1
45	91176.204	1991	221991.77	2874	1	243475.55	2621	1
44	91164.253	1992	221819.44	2870	1	243318.44	2617	1
43	91152.294	1994	221647.33	2867	1	243161.55	2613	1
42	91140.328	1995	221475.45	2863	1	243004.89	2601	1
41	91128.353	1996	221303.79	2860	1	242848.44	2606	1
40	91116.371	1998	221132.34	2856	1	242692.22	2602	1
39	91104.382	1999	220961.12	2852	1	242536.22	2599	1
38	91092.384	2000	220790.12	2849	1	242380.44	2595	1
37	91080.379	2001	220619.34	2845	1	242224.88	2591	1
36	91068.366	2003	220448.78	2841	1	242069.54	2587	1
35	91056.346	2004	220278.43	2838	1	241914.42	2584	1
34	91044.317	2005	220108.31	2834	1	241759.52	2580	1
33	91032.281	2007	219938.40	2830	1	241604.84	2577	1
32	91020.238	2008	219768.71	2827	1	241450.38	2573	1
31	91008.086	2009	219599.23	2823	1	241296.13	2569	1
30	90996.127	2010	219429.97	2819	1	241142.10	2566	1

24. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	41495.79	441	45607.76	586.7	109909.362	2430
32	41522.26	441	45642.90	586.8	109923.950	2433
33	41548.72	441	45678.06	586.0	109938.551	2435
34	41575.17	441	45713.22	586.1	109953.165	2437
35	41601.63	441	45748.39	586.3	109967.793	2439
36	41628.80	441	45783.57	586.4	109982.434	2441
37	41654.53	441	45818.76	587.6	109997.088	2444
38	41680.97	441	45853.97	587.8	110011.755	2446
39	41707.41	441	45889.17	587.9	110026.435	2448
40	41733.84	441	45924.39	587.1	110041.129	2450
41	41760.28	441	45959.62	587.2	110055.836	2452
42	41786.71	440	45994.86	587.4	110070.556	2455
43	41813.13	440	46030.11	587.5	110085.289	2457
44	41839.55	440	46065.36	588.7	110100.046	2459
45	41865.97	440	46100.63	588.9	110114.796	2461
46	41892.39	440	46135.91	588.0	110129.569	2463
47	41918.80	440	46171.19	588.2	110144.355	2466
48	41945.21	440	46206.49	588.3	110159.165	2468
49	41971.61	440	46241.79	588.5	110173.968	2470
50	41998.01	440	46277.10	589.7	110188.794	2 72
51	42024.41	440	46318.43	589.8	110203.643	2475
52	42050.80	440	46347.76	589.0	110218.487	2477
53	42077.19	440	46383.10	589.1	110233.353	2479
54	42103.58	440	46418.45	589.3	110248.233	2481
55	42129.96	440	46453.82	589.4	110263.126	2483
56	42156.34	440	46489.19	590.6	110278.033	2486
57	42182.72	440	46524.57	590.8	110292.952	2488
58	42209.09	440	46559.96	590.9	110307.885	2490
59	42235.46	439	46595.36	590.1	110322.832	2492
60	42261.83	439	46630.77	590.2	110337.792	2495

65. Grad.

Prima	Sinus	10"	Tangens	10"	In	Secans	10"	In
29	90984.060	2012	219260.93	2816	1	240988.29	2562	1
28	90971.986	2013	219092.10	2812	1	240834.69	2558	1
27	90959.904	2014	218923.49	2809	1	240681.32	2555	1
26	90947.814	2015	218755.10	2805	1	240528.15	2551	1
25	90935.716	2017	218586.91	2802	1	240375.20	2548	1
24	90923.611	2018	218418.94	2798	1	240222.47	2544	1
23	90911.498	2019	218251.19	2794	1	240069.95	2540	1
22	90899.738	2021	218083.64	2791	1	239917.64	2537	1
21	90887.249	2022	217916.31	2787	1	239765.55	2533	1
20	90875.113	2023	217749.20	2784	1	239613.67	2530	1
19	90862.969	2024	217582.29	2780	1	239462.01	2526	1
18	90850.818	2026	217415.59	2777	1	239310.55	2523	1
17	90838.659	2027	217249.11	2773	1	239159.31	2520	2
16	90826.492	2028	217082.83	2770	1	239008.28	2516	1
15	90814.317	2030	216916.77	2766	1	238857.46	2512	1
14	90802.135	2031	216750.91	2763	1	238706.85	2509	1
13	90789.945	2032	216585.27	2759	1	238556.45	2505	1
12	90777.748	2033	216419.83	2756	1	238406.25	2502	1
11	90765.543	2035	216254.60	2752	1	238256.27	2498	1
10	90753.330	2036	216089.58	2749	1	238106.50	2495	1
9	90741.109	2037	215924.76	2745	1	237956.93	2491	1
8	90728.881	2039	215760.15	2742	0	237807.58	2488	0
7	90716.645	2040	215595.75	2739	0	237658.43	2484	0
6	90704.401	2041	215431.56	2735	0	237509.48	2481	0
5	90692.150	2042	215267.57	2732	0	237360.75	2477	0
4	90679.891	2044	215103.78	2728	0	237212.22	2474	0
3	90667.625	2045	214940.20	2725	0	237063.90	2471	0
2	90655.350	2046	214776.83	2721	0	236915.78	2467	0
1	90643.0[illegible]	2048	214613.66	2718	0	236767.87	2464	0
0	90630.779	2049	214459.69	2715	0	236620.16	2460	0

25. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	42288.19	439	46666.18	5904	110352.765	2497
2	42314.55	439	46701.61	5916	110367.752	2499
3	42340.90	439	46737.05	5917	110382.752	2501
4	42357.25	439	46772.50	5919	110397.766	2504
5	42393.60	439	46807.96	[illegible]10	110412.792	2506
6	42419.94	439	46843.42	5912	110427.833	2508
7	42446.28	439	46878.90	5914	110442.887	2510
8	42472.62	439	46914.39	5915	110457.954	2513
9	42498.95	439	46949.88	5927	110473.035	2515
10	42525.28	439	46985.39	5929	110488.129	2517
11	42551.61	439	47020 ,0	5920	110503.237	2519
12	42577.93	439	47056.43	5922	110518.358	2521
13	42604.25	439	47091.96	5923	110533.493	2524
14	42630.56	439	47127.51	5925	110548.641	2526
15	42656.87	438	47163.06	5937	110563.802	2528
16	42683.18	438	47198.63	5938	110578.978	2531
17	42709.49	438	47234.20	5930	110594.166	2533
18	42735.79	438	47269.78	5932	110609.369	2535
19	42762.08	438	47305.38	5933	110624.584	2537
20	42788.38	438	47340.98	5935	110639.814	2540
21	42814.67	438	47376.59	5646	110655.057	2542
22	42840.95	438	47412.22	5948	110670.313	2544
23	42867.23	438	47447.85	5940	110685.583	2546
24	42893.51	438	47483.49	5941	110700.867	2549
25	42919.79	438	47519.14	5943	110716.164	2551
26	42946.06	438	47554.81	5945	110731.475	2553
27	42972.33	438	47590.48	5956	110746.799	2555
28	42998.59	438	47626.16	5958	110762.137	2558
29	43024.85	438	47661.85	5950	110777.489	2560
30	43051.11	438	47697.55	5951	110792.854	2562

64. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	90618.481	2050	214282.93	2711	236472.65	2457
58	90606.176	2051	214125.37	2708	236325.35	2454
57	90593.864	2053	213963.01	2705	236178.26	2450
56	90581.543	2054	213800.85	2701	236031.36	2447
55	90569.216	2055	213638.89	2698	235884.67	2443
54	90556.880	2056	213477.14	2694	235738.18	2440
53	90544.537	2058	213315.59	2691	235591.89	2437
52	90532.186	2059	213154.23	2688	235445.81	2433
51	90519.827	2060	212993.08	2684	235299.92	2430
50	90507.461	2062	212832.13	2681	235154.23	2427
49	90495.087	2063	212671.37	2678	235008.75	2423
48	90482.705	2064	212510.82	2675	234863.47	2420
47	90470.316	2065	212350.46	2671	234718.38	2417
46	90457.919	2067	212190.30	2668	234573.49	2413
45	90445.515	2068	212030.34	2665	234428.80	2410
44	90433.102	2069	211870.57	2661	234284.31	2407
43	90420.682	2070	211711.01	2658	234140.02	2403
42	90408.255	2072	211551.64	2655	233995.93	2400
41	90395.820	2073	211392.46	2652	233852.03	2397
40	90383.577	2074	211233.48	2648	233708.33	2394
39	90370.927	2076	211074.70	2645	233564.82	2390
38	90358.468	2077	210916.11	2642	233421.52	2387
37	90346.003	2078	210757.71	2639	233278.40	2384
36	90333.529	2079	210599.51	2635	233135.48	2381
35	90321.048	2081	210441.50	2632	232992.76	2377
34	90308.560	2082	210283.69	2629	232850.23	2374
33	90296.063	2083	210126.07	2626	232707.90	2371
32	90283.559	2085	209968.64	2622	232565.75	2368
31	90271.048	2086	209811.40	2619	232423.81	2364
30	90258.528	2087	209654.36	2616	232282.05	2361

25. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
31	43077.36	438	47733.26	595	110808.233	2564
32	43103.61	437	47768.99	595	110823.626	2567
33	43129.86	437	47804.72	596	110839.032	2569
34	43156.10	437	47840.46	596	110854.452	2571
35	43182.34	437	47876.21	596	110869.896	2574
36	43208.57	437	47911.97	596	110885.333	2576
37	43234.81	437	47947.74	596	110900.794	2578
38	43261.03	437	47983.52	596	110916.269	2580
39	43287.26	437	48019.32	597	110931.757	2583
40	43313.48	437	48055.12	597	110947.259	2585
41	43339.69	437	48090.93	597	110962.775	2587
42	43365.91	437	48126.75	597	110978.304	2590
43	43392.12	437	48162.58	597	110993.848	2592
44	43418.32	437	48198.42	597	111009.405	2594
45	43444.53	437	48234.27	598	111024.976	2596
46	43470.72	437	48270.13	598	111040.560	2599
47	43496.92	437	48306.01	598	111056.158	2601
48	43523.11	436	48341.89	598	111071.771	2603
49	43549.30	436	48377.78	598	111087.396	2606
50	43575.48	436	48413.68	598	111103.036	2608
51	43601.66	436	48449.59	599	111118.690	2610
52	43627.84	436	48485.52	599	111134.357	2613
53	43654.01	436	48521.45	599	111150.038	2615
54	43680.18	436	48557.39	599	111165.733	2617
55	43706.34	436	48593.34	599	111181.442	2619
56	43732.51	436	48629.31	599	111197.165	2622
57	43758.66	436	48665.28	600	111212.901	2624
58	43784.82	446	48701.26	600	111228.652	2626
59	43810.97	436	48737.25	600	111244.426	2629
60	43837.11	436	48773.26	600	111260.194	2631

64. Grad.

Prim.	Sinus	10''	Tangens	10''	Se.ans	10''
29	90246.002	2088	209497.51	2613	232140.49	2358
28	90233.467	2090	209340.84	2601	231999.11	2355
27	90220.925	2091	209184.37	2607	231857.94	2352
26	90208.375	2092	209028.09	2603	231716.95	2348
25	90195.818	2093	208872.00	2600	231576.15	2345
24	90183.253	2095	208716 10	2597	231435.54	2342
23	90170.680	2096	208560.39	2594	231295.13	2339
22	90158.100	2097	208404.86	2591	231154.90	2336
21	90145.512	2099	208249.53	2588	231014.86	2333
20	90132.916	2100	208094.38	2584	230875.01	2329
19	90120.313	2101	207939.42	2581	230735.35	2326
18	90107.702	2102	207784.65	2578	230595.88	2323
17	90095.084	2104	207630.07	2575	230456.60	2320
16	90082.458	2105	207475.67	2572	230317.51	2317
15	90069.824	2106	207321.46	2569	230178.60	2314
14	90057.183	2107	207167.43	2566	230039.88	2311
13	90044.534	2109	207013.59	2563	229901.34	2308
12	90031.877	2110	206859.93	2560	229762.99	2305
11	90019.213	2111	206706.46	2557	229624.83	2301
10	90006.541	2112	206553.18	2553	229486.85	2298
9	89992.862	2114	206400.08	2550	229349.06	2295
8	89981.175	2115	206247.16	2547	229211.45	2292
7	89968.480	2116	206094.42	2544	229074.03	2289
6	89955.778	2118	205941.87	2541	228936.79	2286
5	89943.068	2119	205789.50	2538	228799.74	2283
4	89930.351	2120	205637.32	2535	228662.86	2280
3	89917.625	2121	205485.31	2532	228526.18	2277
2	89904.893	2123	205333.49	2529	228389.67	2274
1	89892.353	2124	205181.84	2526	228253.34	2271
0	89879.405	2125	205030.38	2523	228117.20	2268

26. Grad.

Prim.	Sinus	10″	Tangens	10″	Secans	10″
1	43863.26	436	48809.27	600	111275.986	2633
2	43889.40	436	48845.30	600	111291.792	2636
3	43915.53	436	48881.33	601	111307.612	2638
4	43941.66	435	48917.37	601	111323.446	2640
5	43967.79	435	48953.43	601	111339.293	2643
6	43993.92	435	48989.49	601	111355.155	2645
7	44020.04	435	49025.57	601	111371.031	2647
8	44046.15	435	49061.65	601	111386.920	2650
9	44072.27	435	49097.75	602	111402.823	2652
10	44098.38	435	49133.86	602	111418.741	2654
11	44124.48	435	49169.97	602	111434.673	2657
12	44150.58	435	49206.10	602	111450.618	2659
13	44176.68	435	49242.24	602	111466.578	2661
14	44202.78	435	49278.38	602	111482.551	2664
15	44228.87	435	49314.54	603	111498.539	2666
16	44254.96	435	49350.71	603	111514.540	2668
17	44281.04	435	49386.89	603	111530.556	2671
18	44307.12	435	49423.08	603	111546.585	2673
19	44333.19	435	49459.28	603	111562.629	2675
20	44359.27	434	49495.49	604	111578.686	2678
21	44385.33	434	49531.71	604	111594.758	2680
22	44411.40	434	49567.94	604	111610.844	2682
23	44437.46	434	49604.18	604	111626.944	2685
24	44463.52	434	49640.43	604	111643.058	2687
25	44489.57	434	49676.69	604	111659.186	2689
26	44515.62	434	49712.97	605	111675.328	2692
27	44541.67	434	49749.25	605	111691.485	2694
28	44567.71	434	49785.54	605	111707.655	2696
29	44593.75	434	49821.85	605	111723.840	2699
30	44619.78	434	49858.16	605	111740.038	2701

63. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	89866.649	2126	204879.12	2522	227981.24	[illegible]
58	89853.886	2128	204728.00	2517	227845.46	2262
57	89841.115	2129	204577.08	2514	227709.[illegible]	[illegible]
56	89828.337	2130	204426.34	2511	227574.45	[illegible]
55	89815.551	2131	204275.78	2508	227439.21	[illegible]
54	89802.758	2133	204125.40	2505	227304.15	[illegible]
53	89789.956	2134	203975.19	2502	227169.27	[illegible]
52	89777.148	2135	203825.17	2499	227034.57	[illegible]
51	89764.331	2137	203675.32	2496	226900.05	2241
50	89751.508	2138	203525.65	2493	226765.71	2238
49	89738.676	2139	203376.15	2490	226631.55	2235
48	89725.837	2140	203226.83	2487	226497.56	2232
47	89712.990	2142	203077.69	2484	226363.75	2229
46	89700.136	2143	202928.75	2482	226230.12	2226
45	89687.274	2144	202779.94	2479	226096.67	2223
44	89674.405	2145	202631.33	2476	225963.39	2220
43	89661.528	2147	202482.89	2473	225830.29	2217
42	89648.643	2148	202334.62	2470	225697.36	2214
41	89635.751	2149	202186.53	2467	225564.61	2211
40	89622.851	2150	202038.62	2464	225432.04	2208
39	89609.944	2152	201890.88	2461	225299.64	2205
38	89597.029	2153	201743.31	2458	225167.41	2203
37	89584.106	2154	201595.92	2455	225035.36	2200
36	89571.176	2156	201448.69	2452	224903.48	2197
35	89558.238	2157	201301.64	2450	224771.78	2194
34	89545.293	2158	201154.77	2447	224640.24	2191
33	89532.340	2159	201008.06	2444	224508.89	2188
32	89519.380	2161	200861.53	2441	224377.70	2185
31	89506.412	2162	200715.16	2438	224246 69	2182
30	89493.456	2163	200568.97	2435	224115.84	2180

26. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	44645.81	434	49894.49	605	111756.251	2704
32	44671.84	434	49930.82	606	111772.478	2705
33	44697.86	434	49967.17	606	111788.720	2708
34	44723.88	434	50003.52	606	111804.975	2711
35	44749.90	434	50039.89	606	111821.244	2713
36	44775.91	433	50076.27	606	111837.529	2715
37	44801.92	433	50112.66	607	111853.827	2718
38	44827.92	433	50149.06	607	111870.139	2720
39	44853.92	433	50185.47	607	111886.465	2722
40	44879.92	433	50221.89	607	111902.806	2725
41	44905.91	433	50258.32	607	111919.161	2727
42	44931.90	433	50294.76	607	111935.530	2730
43	44957.88	433	50331.21	608	111951.914	2732
44	44983.87	433	50367.67	608	111968.311	2734
45	45009.84	433	50404.15	608	111984.723	2737
46	45035.82	433	50440.63	608	112001.150	2739
47	45061.79	433	50477.13	608	112017.590	2741
48	45087.75	433	50513.63	608	112034.045	2744
49	45113.72	433	50550.15	609	112050.515	2746
50	45139.67	433	50586.68	609	112066.998	2749
51	45165.63	433	50623.22	609	112083.496	2751
52	45191.58	432	50659.77	609	112100.008	2753
53	45217.53	432	50696.32	609	112116.535	2756
54	45243.47	432	50732.90	610	112133.076	2758
55	45269.41	432	50769.48	610	112149.631	2761
56	45295.35	432	50806.07	610	112166.201	2763
57	45321.28	432	50842.67	610	112182.785	2765
58	45347.21	432	50879.28	610	112199.383	2768
59	45373.13	432	50915.91	610	112215.996	2770
60	45399.05	432	50952.54	611	112232.624	2773

63. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	89480.453	2164	200422.95	2433	223985.17	2177
28	89467.462	2166	200277.10	2430	223854.67	2174
27	89454.464	2167	200131.41	2427	223724.35	2171
26	89441.458	2168	199985.90	2424	223594.19	2168
25	89428.445	2169	199840.56	2421	223464.20	2165
24	89415.424	2171	199695.39	2418	223334.38	2162
23	89402.395	2172	199550.38	2416	223204.73	2160
22	89389.359	2173	199405.54	2413	223075.26	2157
21	89376.315	2174	199260.87	2401	222945.95	2154
20	89363.264	2176	199116.37	2407	222816.81	2151
19	89350.205	2177	198904.72	2404	222687.83	2148
18	89337.139	2178	198827.87	2402	222559.03	2146
17	89324.065	2180	198683.87	2399	222430.39	2143
16	89310.983	2181	198540.03	2397	222301.92	2140
15	89297.894	2182	198396.36	2393	222173.62	2137
14	89284.798	2183	198252.86	2391	222045.48	2134
13	89271.694	2185	198109.52	2388	221917.51	2132
12	89258.582	2186	197966.35	2386	221789.71	2129
11	89245.463	2188	197823.34	2382	221662.07	2126
10	89232.336	2189	197680.50	2380	221534.60	2123
9	89219.201	2190	197537.82	2377	221407.30	2121
8	89206.059	2191	197395.31	2374	221280.16	2118
7	89192.910	2192	197252.96	2371	221155.18	2115
6	89179.753	2193	197110.77	2369	221026.37	2112
5	89166.588	2195	196968.74	2366	220899.72	2110
4	89153.416	2196	196826.88	2363	220773.23	2107
3	89140.237	2197	196685.18	2361	220646.91	2104
2	89127.049	2198	196543.64	2358	220520.75	2101
1	89113.855	2200	196402.27	2355	220394.76	2099
0	89100.652	2201	196261.05	2352	220268.93	2096

27. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	45424.97	432	50989.19	611	112249.266	2775
2	45450.88	432	51025.85	611	112265.922	2777
3	45476.79	432	51062.52	611	112282.592	2780
4	45502.69	432	51099.19	611	112299.277	2782
5	45528.59	432	51135.88	612	112315.977	2785
6	45554.49	432	51172.58	612	112332.691	2787
7	45580.38	432	51209.50	612	112349.420	2789
8	45606.27	431	51246.02	612	112366.163	2792
9	45632.16	431	51282.75	612	112382.920	2794
10	45658.04	431	51319.50	612	112399.692	2797
11	45683.92	431	51356.25	613	112416.479	2799
12	45709.79	431	51393.02	613	112433.280	2802
13	45735.66	431	51429.80	613	112450.095	2804
14	45761.53	431	51466.58	613	112466.926	2806
15	45787.39	431	51503.38	613	112483.770	2809
16	45813.25	431	51540.19	614	112500.630	2811
17	45839.10	431	51577.02	614	112517.504	2814
18	45864.95	431	51613.85	614	112534.392	2816
19	45890.80	431	51650.69	614	112551.295	2819
20	45916.64	431	51687.55	614	112568.213	2821
21	45942.48	431	51724.41	614	112585.145	2823
22	45968.32	431	51761.29	615	112602.092	2826
23	45994.15	430	51798.18	615	112619.053	2828
24	46019.98	430	51835.08	615	112636.032	2831
25	46045.80	430	51871.99	615	112653.020	2833
26	46071.62	430	51908.91	615	112670.026	2836
27	46097.44	430	51945.84	616	112687.046	2838
28	46123.25	430	51982.78	616	112704.081	2841
29	46149.06	430	52019.74	616	112721.130	2843
30	46174.86	430	52056.70	616	112738.195	2845

62.Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	89087.443	2202	196120.00	2350	220143.26	2094
58	89074.222	2203	195979.10	2347	220017.75	2091
57	89061.000	2205	195838.37	2344	219892.40	2088
56	89047.768	2206	195697.80	2342	219767.21	2085
55	89034.528	2207	195557.39	2340	219642.19	2083
54	89021.280	2208	195417.13	2336	219517.33	2080
53	89008.025	2210	195277.04	2334	219392.62	2077
52	88994.763	2211	195137.11	2331	219268.08	2075
51	88981.493	2212	194997.33	2328	219143.70	2072
50	88968.215	2213	194857.71	2326	219019.47	2069
49	88954.930	2215	194718.26	2323	218895.41	2067
48	88941.637	2216	194578.96	2321	218771.50	2064
47	88928.337	2217	194439.81	2318	218647.75	2061
46	88915.029	2218	194300.83	2315	218524.17	2059
45	88901.714	2220	194162.00	2313	218400.74	2056
44	88888.391	2221	194023.33	2310	218277.46	2053
43	88875.061	2222	193884.81	2308	218154.35	2051
42	88861.723	2223	193746.45	2305	218031.39	2048
41	88848.378	2225	193608.25	2302	217908.59	2046
40	88835.025	2226	193470.20	2200	217785.94	2043
39	88821.665	2227	193332.31	2297	217663.46	2040
38	88808.297	2228	193194.57	2295	217541.12	2038
37	88794.921	2230	193056.98	2292	217418.95	2035
36	88781.538	2231	192919.56	2289	217296.93	2033
35	88768.148	2232	192782.28	2287	217275.06	2030
34	88754.750	2233	192645.16	2284	217053.35	2027
33	88741.345	2235	192508.19	2282	216931.80	2025
32	88727.932	2236	192371.38	2279	216810.40	2022
31	88714.511	2237	192234.72	2277	216689.15	2020
30	88701.083	2238	192098.21	2275	216568.06	2017

27. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	46200.66	430	52093.68	616	112755.274	2848
32	46226.46	430	52130.67	617	112772.367	2850
33	46252.25	430	52167.67	617	112789.475	2853
34	46278.04	430	52204.68	617	112806.599	2855
35	46303.82	430	52241.70	617	112823.737	2858
36	46329.60	430	52278.74	617	112840.889	2860
37	46355.38	430	52315.78	617	112858.057	2863
38	46381.15	429	52352.84	618	112875.239	2865
39	46406.92	429	52389.90	618	112892.436	2868
40	46432.69	429	52426.98	618	112909.648	2870
41	46458.45	429	52464.07	618	112926.874	2873
42	46484.20	429	52501.17	618	112944.116	2875
43	46509.96	429	52538.29	619	112961.372	2877
44	46535.71	429	52575.41	619	112978.643	2880
45	46561.45	429	52612.54	619	112995.929	2882
46	46587.19	429	52649.69	619	113013.229	2885
47	46612.93	429	52686.85	619	113030.545	2887
48	46638.66	429	52724.02	620	113047.876	2890
49	46664.39	429	52761.20	620	113065.221	2892
50	46690.12	429	52798.39	620	113082.581	2895
51	46715.84	429	52835.59	620	113099.956	2897
52	46741.56	429	52872.81	620	113117.346	2900
53	46767.27	429	52910.04	621	113134.751	2902
54	46792.98	428	52947.27	621	113152.171	2905
55	46818.69	428	52984.52	621	113169.606	2907
56	46844.39	428	53021.78	621	113187.056	2910
57	46870.09	428	53059.06	621	113204.521	2912
58	46895.78	428	53096.34	621	113222.001	2915
59	46921.47	428	53133.64	622	113239.495	2917
60	46947.16	428	53170.94	622	113257.005	2920

62. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	88687.648	2240	191961.86	2272	216447.12	2015
28	88674.205	2241	191825.65	2269	216326.33	2012
27	88660.754	2242	191689.60	2266	216205.70	2009
26	88647.296	2244	191553.70	2264	216085.22	2007
25	88633.831	2245	191417.95	2261	215964.89	2004
24	88620.358	2246	191282.36	2259	215844.71	2002
23	88606.877	2247	191146.91	2256	215724.69	1999
22	88593.389	2248	191011.61	2254	215604.82	1997
21	88579.894	2250	190876.47	2251	215485.10	1994
20	88566.391	2251	190741.47	2249	215365.53	1992
19	88552.881	2252	190606.63	2247	215246.11	1989
18	88539.363	2254	190471.93	2244	215126.84	1987
17	88525.837	2255	190337.38	2241	215007.72	1984
16	88512.304	2256	190202.99	2239	214888.75	1982
15	88498.764	2257	190068.74	2236	214769.93	1979
14	88485.226	2258	189934.63	2234	214651.27	1977
13	88471.661	2260	189800.68	2232	214532.75	1974
12	88458.098	2261	189666.88	2229	214414.37	1972
11	88444.527	2262	189533.22	2227	214296.15	1969
10	88430.949	2262	189399.71	2224	214178.08	1967
9	88417.364	2265	189266.34	2222	214060.15	1965
8	88403.771	2266	189133.13	2219	213942.38	1962
7	88390.171	2267	189000.06	2217	213824.75	1959
6	88376.563	2268	188867.13	2214	213707.26	1957
5	88362.948	2270	188734.36	2211	213589.93	1955
4	88349.325	2271	188601.72	2209	213472.74	1952
3	88335.695	2272	188469.24	2207	213355.70	1950
2	88322.057	2273	188336.89	2205	213238.80	1947
1	88308.412	2275	188204.70	2202	213122.05	1945
0	88294.759	2276	188072.65	2100	213005.45	1942

28. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	46972.84	428	53208.26	622	113274.530	2922
2	46998.52	428	53245.59	622	113292,070	2925
3	47024.19	428	53282.93	622	113309.624	2927
4	47049.86	428	53320.29	623	113327.194	2930
5	47075.53	428	53357.65	623	113344.779	2932
6	47101.19	428	53395.03	623	113362.379	2935
7	47126.85	428	53432.41	623	113379.994	2937
8	47152.50	428	53469.81	623	113397.624	2940
9	47178.15	427	53507.23	624	113415.269	2942
10	47203.80	427	53544.65	624	113432.929	2945
11	47229.44	427	53582.08	624	113450.604	2947
12	47255.08	427	53619.53	624	113468.295	2950
13	47280.71	427	53656.99	624	113486.000	2952
14	47306.34	427	53694.46	625	113503.721	2955
15	47331.97	427	53731.94	625	113521.457	2957
16	47357.59	427	53769.43	625	113523.908	2960
17	47383.21	427	53806.94	625	113556.974	2962
18	47408.82	427	53844.45	625	113574.755	2965
19	47434.43	427	53881.98	626	113592.552	2968
20	47460.04	427	53919.52	626	113610.363	2970
21	47485.64	427	53957.07	626	113628.190	2973
22	47511.24	427	53994.64	626	113646.032	2975
23	47536.83	427	54032.21	626	113663.890	2978
24	47562.42	426	54069.80	627	113681.762	2980
25	47588.0	426	54107.40	627	113699.650	2983
26	47613.59	426	54145.01	627	113717.553	2985
27	47639.17	426	54182.63	627	113735.471	2988
28	47664.74	426	54220.26	627	113753.405	2990
29	47690.31	426	54257.91	628	113771.354	2993
30	47715.88	426	54295.57	628	113789.318	2996

61. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	0″
59	88281.099	2277	187940.74	2197	212888.99	1940
58	88267.432	2278	187808.97	2195	212772.67	1938
57	88253.757	2279	187677.36	2193	212656.51	1935
56	88240.074	2281	187545.88	2190	212540.48	1933
55	88226.384	2282	187414.55	2189	212424.60	1930
54	88212.687	2283	187283.36	2185	212308.87	1928
53	88198.982	2285	187152.31	2183	212193.28	1926
52	88185.269	2286	187021.41	2181	212077.83	1923
51	88171.549	2287	186890.64	2177	211962.53	1921
50	88157.822	2288	186760.03	2176	211847.37	1918
49	88144.087	2290	186629.55	2174	211732.35	1916
48	88130.345	2291	186499.21	2171	211617.48	1914
47	88116.596	2292	186369.02	2169	211502.74	1911
46	88102.838	2293	186238.96	2167	211388.15	1909
45	88089.074	2295	186109.05	2164	211273.71	1906
44	88075.301	2296	185979.28	2162	211159.40	1904
43	88061.522	2297	185849.65	2160	211045.23	1902
42	88047.735	2298	185720.15	2157	210931.21	1809
41	88033.941	2200	185590.80	2155	210817.33	1897
40	88020.139	2301	185461.59	2153	210703.59	1895
39	88006.330	2302	185332.52	2150	210589.98	1892
38	87992.513	2303	185203.58	2148	210476.52	1890
37	87978.689	2305	185074.79	2146	210363.20	1888
36	87964.857	2306	184946.13	2143	210250.02	1885
35	87951.018	2307	184817.61	2141	210136.98	1883
34	87937.172	2308	184689.23	2139	210024.08	1881
33	87923.318	2310	184560.99	2136	209911.31	1878
32	87909.456	2311	184432.89	2134	209798.69	1876
31	87895.588	2312	184304.92	2132	209686.20	1874
30	87881.711	2313	184177.09	2130	209573.85	1871

V

28. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	47741.44	426	54333.24	628	113807.298	2998
32	47766.99	426	54370.92	628	113825.292	3001
33	47792.55	426	54408.62	628	113843.302	3003
34	47818.10	426	54446.32	628	113861.428	3006
35	47843.64	426	54484.04	629	113879.369	3008
36	47869.19	426	54521.77	629	113897.425	3011
37	47894.72	426	54559.51	629	113915.496	3013
38	47920.26	426	54597.26	629	113933.583	3016
39	47945.79	425	54635.03	629	113951.686	3019
40	47971.31	425	54672.81	630	113969.803	3021
41	47996.83	425	54710.60	630	113987.936	3024
42	48022.35	425	54748.40	630	114006.085	3026
43	48047.86	425	54786.21	630	114024.249	3029
44	48073.37	425	54824.04	630	114042.428	3031
45	48098.88	425	54861.88	631	114060.623	3034
46	48124.38	425	54899.73	631	114078.833	3037
47	48149.87	425	54937.59	631	114097.059	3039
48	48175.37	425	54975.46	631	114115.300	3041
49	48200.86	425	55013.35	632	114133.557	3044
50	48226.34	425	55051.25	632	114151.829	3047
51	48251.82	425	55089.16	632	114170.117	3049
52	48277.30	425	55127.08	632	114188.420	3052
53	48302.77	424	55165.02	632	114206.739	3055
54	48328.24	424	55202.97	633	114225.074	3057
55	48353.70	424	55240.92	633	114243.423	3060
56	48379.16	424	55278.90	633	114261.789	3062
57	48404.62	424	55316.88	633	114280.170	3065
58	48430.07	424	55354.88	633	114298.567	3068
59	48455.52	424	55392.88	634	114316.979	3070
60	48480.96	424	55430.90	634	114335.407	3073

61. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
29	87867.828	2314	184049.39	2127	209461.64	186[illegible]
28	87853.936	2316	183921.84	2125	209349.57	18[illegible]
27	87840.034	2317	183794.42	2123	209237.64	186[illegible]
26	87826.132	2318	183667.13	2120	209125.84	1862
25	87812.218	2319	183539.99	2118	209014.18	186[illegible]
24	87798.298	2321	183412.97	2116	208902.65	185[illegible]
23	87784.369	2322	183286.10	2114	208791.27	1855
22	87770.434	2323	183159.36	2111	208680.02	1853
21	87756.490	2324	183032.75	2109	208568.90	1851
20	87742.540	2326	182906.28	2107	208457.92	1849
19	87728.582	2327	182779.94	2105	208347 08	184[illegible]
18	87714.616	2328	182653.74	2102	208236.37	1844
17	87700.644	2329	182527.67	2100	208125.80	1842
16	87686.663	2330	182401.73	2098	208015.36	184[illegible]
15	87672.676	2332	182275.93	2096	207905.06	183[illegible]
14	87658.680	2333	182150.26	2094	207794.89	183[illegible]
13	87644.678	2334	182024.73	2091	207684.86	1833
12	87630.668	2336	181899.32	2089	207574.96	1831
11	87616.651	2337	181774.05	2087	207465.19	1828
10	87602.626	2338	181648.92	2085	207355.56	1826
9	87588.594	2339	181523.91	2082	207246.06	1824
8	87574.554	2340	181399.04	2080	207136.70	1822
7	87560.507	2342	181274.30	2078	207021.46	182[illegible]
6	87546.453	2343	181149.69	2076	206918.36	1817
5	87532.391	2344	181025.21	2074	206809.40	1815
4	87518.322	2345	180900.86	2072	206700.56	1813
3	87504.245	2347	180776.64	2069	206591.86	1811
2	87490.161	2348	180652.56	2067	206483.28	18[illegible]9
1	87476.070	2349	180528.60	2065	206874.84	18[illegible]6
0	87461.971	2350	180404.78	2063	206266.53	1804

V 2

29. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	48506.40	424	55468.94	634	114353.850	3075
2	48531.84	424	55506.98	634	114372.309	3078
3	48557.27	424	55545.04	634	114390.784	3081
4	48582.70	424	55583.11	635	114409.274	3083
5	48608.12	424	55621.19	635	114427.781	3086
6	48633.54	424	55659.29	635	114446.302	3088
7	48658.95	424	55697.39	635	114464.840	3091
8	48684.36	423	55735.51	635	114483.393	3094
9	48709.77	423	55773.64	636	114501.962	3096
10	48735.17	423	55811.79	636	114520.546	3099
11	48760.57	423	55849.94	636	114539.146	3102
12	48785.97	423	55888.11	636	114557.762	3104
13	48811.36	423	55926.29	636	114576.394	3107
14	48836.74	423	55964.48	637	114595.042	3109
15	48862.12	423	56002.69	637	114613.705	3112
16	48887.50	423	56040.91	637	114632.384	3115
17	48912.88	423	56079.14	637	114651.079	3117
18	48938.24	423	56117.38	637	114669.790	3120
19	48963.61	423	56155.64	638	114688.516	3123
20	48988.97	423	56193.91	638	114707.258	3125
21	49014.33	423	56232.19	638	114726.017	3128
22	49039.68	422	56270.48	638	114744.790	3131
23	49065.03	422	56308.78	638	114763.580	3133
24	49090.37	422	56347.10	639	114782.386	3136
25	49115.72	422	56385.43	639	114801.208	3138
26	49141.05	422	56423.78	639	114820.945	3141
27	49166.38	422	56462.13	639	114838.898	3144
28	49191.71	422	56500.60	640	114857.768	3146
29	49217.04	422	56538.88	640	114876.653	3149
30	49242.36	422	56577.28	640	114895.554	3152

60.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
59	87447.864	2352	180281.08	2061	206158.36	1802
58	87433.751	2353	180157.51	2059	206050.31	1800
57	87419.630	2354	180034.08	2056	205942.39	1798
56	87405.501	2355	179910.77	2054	205834.60	1796
55	87391.366	2356	179787.59	2052	205726.95	1793
54	87377.222	2358	179664.54	2050	205619.42	1791
53	87363.072	2359	179541.62	2048	205512.03	1789
52	87348.914	2360	179418.82	2046	205404.76	1787
51	87334.748	2361	179296.16	2043	205297.62	1785
50	87320.575	2363	179173.62	2041	205190.61	1783
49	87306.395	2364	179051.21	2039	205083.73	2780
48	87292.208	2365	178928.93	2037	204976.98	1778
47	87278.028	2366	178806.78	2035	204870.36	1776
46	87263.810	2368	178684.75	2033	204763.86	1774
45	87249.601	2369	178562.85	2031	204657.50	1772
44	87235.384	2370	178441.07	2029	204551.26	1770
43	87221.159	2371	178319.43	2027	204445.15	1768
42	87206.927	2372	178197.90	2024	204339.16	1766
41	87192.688	2374	178076.51	2022	204233.30	1763
40	87178.441	2375	177955.24	2020	204127.57	1761
39	87164.187	2376	177834.09	2018	204021.97	1759
38	87149.926	2377	177713.07	2016	203916.49	1757
37	87135.657	2379	177592.18	2014	203811.14	1755
36	87121.381	2380	177471.41	2012	203705.92	1753
35	87107.098	2381	177350.76	2010	203600.82	1751
34	87092.806	2382	177230.24	2008	203495.85	1749
33	87078.508	2384	177109.85	2006	203391.00	1747
32	87064.203	2385	176989.57	2004	203286.27	1745
31	87049.890	2386	176869.43	2002	203181.68	1742
30	87035.570	2387	176749.40	2000	203077.20	1740

29. Grad.

Prima	Sinus	10''	Targens	10''	Secans	10''
31	49267.67	422	56615.68	640	114914.471	3154
32	49292.98	422	56654.10	640	114933.404	3157
33	49318.29	422	56692.53	641	114952.353	3160
34	49343.59	422	56730.98	641	114971.318	3162
35	49368.89	422	56769.44	641	114990.299	3165
36	49394.19	422	56807.91	641	115009.296	3168
37	49419.48	421	56846.39	641	115028.309	3170
38	49444.76	421	56884.88	642	115047.338	3173
39	49470.05	421	56923.39	642	115066.383	3176
40	49495.32	421	56961.91	642	115085.445	3178
41	49520.60	421	57000.45	642	115104.522	3181
42	49545.87	421	57038.99	643	115123.615	3184
43	49571.13	421	57077.55	643	115142.724	3186
44	49596.39	421	57116.12	643	115161.850	3189
45	49621.65	421	57154.71	643	115180.991	3192
46	49646.90	421	57193.31	643	115200.149	3194
47	49672.15	421	57231.92	644	115219.323	3197
48	49697.40	421	57270.54	644	115238.512	3200
49	49722.64	421	57309.18	644	115257.718	3202
50	49747.87	421	57347.82	644	115276.941	3205
51	49773.10	420	57386.49	644	115296.179	3208
52	49798.33	420	57425.16	645	115315.434	3211
53	49823.55	420	57463.85	645	115334.704	3213
54	49848.77	420	57502.55	645	115353.991	3216
55	49873.99	420	57541.26	645	115373.294	3219
56	49899.20	420	57579.99	646	115392.614	3221
57	49924.41	420	57618.73	646	115411.949	3224
58	49949.61	420	57657.48	646	115431.301	3227
59	49974.81	420	57696.25	646	115450.669	3230
60	50000.00	420	57735.03	646	115470.054	3232

60. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	87021.242	2388	176629.50	1997	202972.86	1738
28	87006.907	2390	176509.72	1995	202868.63	1736
27	86992.564	2391	176390.07	1993	202764.53	1734
26	86978.215	2392	176270.53	1991	202660.56	1732
25	86963.857	2393	176151.12	1989	202556.70	1730
24	86949.493	2395	176031.83	1987	202452.97	1728
23	86935.121	2396	175912.67	1985	202349.37	1726
22	86920.742	2397	175793.62	1983	202245.89	1724
21	86906.355	2398	175674.70	1981	202142.53	1722
20	86891.961	2399	175555.90	1979	202039.29	1720
19	86877.560	2400	175437.22	1977	201936.17	1718
18	86863.151	2402	175318.66	1975	201833.18	1716
17	86848.735	2403	175200.23	1973	201730.31	1714
16	86834.312	2404	175081.91	1971	201627.56	1712
15	86819.881	2406	174963.71	1969	201524.94	1701
14	86805.443	2407	174845.64	1967	201422.43	1708
13	86790.998	2408	174727.68	1965	201320.05	1706
12	86776.545	2409	174609.84	1963	201217.79	1704
11	86762.085	2411	174492.13	1961	201115.64	1702
10	86747.618	2412	174374.53	1959	201013.62	1700
9	86733.143	2413	174257.05	1957	200911.72	1698
8	86718.661	2414	174139.69	1955	200809.94	1696
7	86704.172	2415	174022.45	1953	200708.28	1693
6	86689.675	2417	173905.33	1951	200606.74	1692
5	86675.171	2418	173788.33	1949	200505.32	1690
4	86660.659	2419	173671.44	1947	200404.02	1688
3	86646.141	2420	173554.67	1945	200302.83	1686
2	86631.615	2422	173438.03	1943	200201.77	1684
1	86617.081	2423	173321.49	1941	200100.83	1682
0	86602.543	2424	173205.08	1939	200000.00	1680

30. Grad.

Pr. ma	Sinus	10″	Tangens	10″	Secans	10″
1	50025.19	420	57773.82	647	115489.45	323
2	50050.37	420	57812.62	647	115508.87	324
3	50075.55	420	57851.44	647	115528.30	324
4	50100.73	420	57890.27	647	115547.75	324
5	50125.90	420	57929.11	648	115567.22	325
6	50151.07	419	57967.97	648	115586.70	325
7	50176.24	419	58006.84	648	115606.20	325
8	50201.40	419	58045.73	648	115625.72	325
9	50226.55	419	58084.62	648	115645.25	326
10	50251.70	419	58123.53	649	115664.79	326
11	50276.85	419	58162.45	649	115684.36	326
12	50301.99	419	58201.39	649	115703.94	326
13	50327.13	419	58240.34	649	115723.54	327
14	50352.27	419	58279.30	649	115743.15	327
15	50377.40	419	58318.28	650	115762.78	327
16	50402.52	419	58357.26	650	115782.43	328
17	50427.64	419	58396.27	650	115802.09	328
18	50452.76	419	58435.28	650	115821.77	328
19	50477.87	418	58474.31	651	115841.46	328
20	50502.98	418	58513.35	661	115861.18	329
21	50528.09	418	58552.41	651	115880.91	329
22	50553.19	418	58591.47	651	115900.65	329
23	50578.28	418	58630.56	651	115920.41	330
24	50603.38	418	58669.65	651	115940.19	330
25	50628.46	418	58708.76	652	115959.99	330
26	50653.55	418	58747.88	652	115979.80	330
27	50678.63	418	58787.02	652	115999.63	331
28	50703.70	418	58826.16	653	116019.47	331
29	50728.77	418	58865.33	653	116039.33	331
30	50753.84	418	58904.50	653	116059.21	331

59. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	0″
59	86587.99	243	173088.78	1937	199899.29	1678
58	86573.44	243	172972.60	1936	199798.70	1676
57	86558.87	243	172856.54	1934	199698.23	1674
56	86544.30	243	172740.60	1932	199597.88	1672
55	86529.73	243	172624.77	1930	199497.64	1670
54	86515.14	243	172509.05	1928	199397.53	1668
53	86500.55	243	172393.45	1926	199297.52	1666
52	86485.95	243	172277.97	1924	199197.64	1664
51	86471.34	243	172162.61	1922	199097.87	1662
50	86456.73	244	172047.36	1920	198998.22	1660
49	86442.11	244	171932.22	1918	198898.69	1658
48	86427.48	244	171817.20	1916	198799.27	1656
47	86412.84	244	171702.30	1914	198699.97	1654
46	86398.20	244	171587.51	1912	198600.80	1652
45	86383.55	244	171472.83	1910	198501.72	1650
44	86368.89	244	171358.27	1909	198402.76	1648
43	86354.23	244	171243.82	1907	198303.93	1646
42	86339.55	245	171129.49	1905	198205.20	1645
41	86324.87	245	171015.27	1903	198106.59	1643
40	86310.19	245	170901.16	1901	198008.10	1641
39	86295.49	245	170787.17	1899	197909.72	1639
38	86280.79	245	170673.29	1897	197811.46	1637
37	86266.08	245	170559.53	1895	197713.31	1635
36	86251.37	245	170445.87	1893	197615.27	1633
35	86236.64	245	170332.33	1892	197517.35	1631
34	86221.91	246	170218.90	1890	197419.54	1629
33	86207.17	246	170105.59	1888	197321.85	1627
32	86192.43	246	169992.38	1886	197224.26	1626
31	86177.68	246	169879.29	1885	197126.80	1624
30	86162.92	246	169766.31	1883	197029.44	1622

X

30. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	50778.90	418	58943.69	653	116079.10	332
32	50803.95	418	58982.89	653	116099.02	332
33	50829.01	417	59022.11	654	116118.94	332
34	50854.06	417	59061.34	654	116138.89	333
35	50879.10	417	59100.58	654	116158.85	333
36	50904.14	417	59139.83	654	116178.83	333
37	50929.18	417	59179.10	655	116198.82	333
38	50954.21	417	59218.39	655	116218.83	334
39	50979.24	417	59257.68	655	116238.86	334
40	51004.26	417	59296.99	655	116258.91	334
41	51029.28	417	59336.32	656	116278.97	335
42	51054.29	417	59375.65	656	116299.05	335
43	51079.30	417	59415.01	656	116319.14	335
44	51104.31	417	59454.37	656	116339.25	335
45	51129.31	417	59493.75	656	116359.38	336
46	51154.30	417	59533.14	657	116379.53	336
47	51179.30	416	59572.54	657	116399.69	336
48	51204.29	416	59611.96	657	116419.87	336
49	51229.27	416	59651.40	657	116440.07	337
50	51254.25	416	59690.84	658	116460.28	337
51	51279.22	416	59730.30	658	116480.51	337
52	51304.20	416	59769.78	658	116500.76	338
53	51329.16	419	59809.26	658	116521.02	338
54	51354.12	416	59848.76	658	116541.30	338
55	51379.08	416	59888.28	659	116561.60	338
56	51404.04	416	59927.81	659	116581.91	339
57	51428.99	416	59967.35	659	116602.24	339
58	51453.93	416	60006.91	659	116622.59	339
59	51478.87	416	60046.48	660	116642.96	340
60	51503.81	416	60086.06	660	116663.34	340

59. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10
29	86148.15	246	169653.44	1881	196932.20	1620
28	86133.37	246	169540.68	1879	196835.07	1618
27	86118.59	246	169428.04	1877	196738.05	1616
26	86103.80	247	169315.50	1875	196641.14	1614
25	86089.01	247	169203.08	1873	196544.34	1612
24	86074.20	247	169090.77	1871	196447.67	1611
23	86059.39	247	168978.56	1869	196351.10	1609
22	86044.57	247	168866.47	1867	196254.64	1607
21	86029.75	247	168754.49	1866	196158.29	1605
20	86014.91	247	168642.61	1864	196062.06	1603
19	86000.07	247	168530.85	1862	195965.93	1601
18	85985.23	247	168419.19	1860	195869.92	1599
17	85970.37	248	168307.65	1858	195774.01	1597
16	85955.51	248	168196.21	1856	195678.22	1596
15	85940.64	248	168084.89	1855	195582.54	1594
14	85925.76	248	167973.67	1853	195486.97	1592
13	85910.88	248	167862.56	1851	195391.50	1590
12	85895.99	248	167751.56	1849	195296.15	1588
11	85881.09	248	167640.67	1847	195200.91	1587
10	85868.19	248	167529.88	1846	195105.77	1585
9	85851.27	249	167419.21	1844	195010.75	1583
8	85836.35	249	167308.64	1842	194915.83	1581
7	85821.42	249	167198.18	1840	194821.02	1579
6	85806.49	249	167087.82	1838	194726.32	1578
5	85791.55	249	166977.58	1837	194631.73	1576
4	85776.60	249	166867.44	1835	194537.25	1574
3	85761.64	249	166757.41	1833	194442.88	1572
2	85746.68	249	166647.48	1831	194348.61	1570
1	85731.31	250	166537.66	1830	194254.45	1569
0	85716.73	250	166427.95	1828	194160.40	1567

31. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	51528.74	415	60125.66	660	116683.74	340
2	51553.67	415	60165.27	660	116704.15	340
3	51578.59	415	60204.90	661	116724.59	341
4	51603.51	415	60244.54	661	116745.04	341
5	51628.42	415	60284.19	661	116765.51	341
6	51653.33	415	60323.86	661	116785.99	342
7	51678.24	415	60363.54	661	116806.49	342
8	51703.14	415	60403.23	662	116827.01	342
9	51728.04	415	60442.94	662	116847.55	342
10	51752.93	415	60482.66	662	116868.10	343
11	51777.82	415	60522.40	662	116888.67	343
12	51802.70	415	60562.15	663	116909.26	343
13	51827.58	415	60601.92	663	116929.86	344
14	51852.45	415	60641.70	663	116950.48	344
15	51877.39	414	60681.49	663	116971.12	344
16	51902.19	414	60721.30	664	116991.78	344
17	51927.05	414	60761.12	664	117012.45	345
18	51951.91	414	60800.95	664	117033.14	345
19	51976.76	414	60840.80	664	117053.85	345
20	52001.61	414	60880.67	665	117074.57	346
21	52026.46	414	60920.54	665	117095.31	346
22	52051.30	414	60960.43	665	117116.07	346
23	52076.13	414	61000.34	665	117136.85	346
24	52100.96	414	61040.26	665	117157.64	347
25	52125.79	414	61086.19	666	117178.45	347
26	52150.61	414	61120.14	666	117199.28	347
27	52175.43	414	61160.11	666	117220.13	348
28	52200.24	414	61200.08	666	117240.99	348
29	52225.05	413	61240.07	667	117261.87	348
30	52249.86	413	61280.08	667	117282.77	348

58.Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	85701.74	250	166318.34	1826	194066.46	1565
58	85686.75	250	166208.84	1824	193972.62	1563
57	85671.75	250	166099.45	1823	193878.89	1561
56	85656.74	250	165990.16	1821	193785.27	1560
55	85641.73	250	165880.99	1819	193691.76	1558
54	85626.71	250	165771.89	1817	193598.35	1557
53	85611.68	251	165662.92	1815	193505.05	1554
52	85596.64	251	165554.05	1814	193411.85	1553
51	85581.60	251	165445.29	1812	193318.76	1551
50	85566.55	251	165336.63	1810	193225.78	1549
49	85551.49	251	165228.08	1809	193132.90	1547
48	85536.43	251	165119.63	18[illegible]	193040.13	1545
47	85521.35	251	165011.28	18[illegible]5	192947.46	1544
46	85506.27	251	164903.04	1803	192854.90	1542
45	85491.19	251	164794.9[illegible]	1802	192762.44	1541
44	85476.09	252	164686.86	180[illegible]	192670.09	1538
43	85460.99	252	164578.93	1798	192577.84	1537
42	85445.88	252	164471.11	1796	192485.70	1535
41	85430.77	252	164365.38	1795	192393.66	1533
40	85415.64	252	164255.76	1793	192301.73	1532
39	85400.51	252	164148.24	1791	192209.90	1530
38	85385.38	252	164040.82	1790	192118.17	1528
37	85370.23	252	163933.51	1788	192026.55	1526
36	85355.08	253	163826.30	1786	191935.03	1525
35	85339.92	253	163719.19	1784	191843.62	1523
34	85324.75	253	163612.18	1783	191752.30	1521
33	85309.58	253	163505.28	1781	191661.09	1519
32	85294.40	253	163398.47	1779	191569.99	1518
31	85279.21	253	163291.77	1778	191478.99	1516
30	85264.02	253	163185.17	1776	191388.09	1514

31. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	52274.66	413	61320.10	667	117303.68	349
32	52299.45	413	61360.13	667	117324.62	349
33	52324.24	413	61400.18	668	117345.57	349
34	52349.03	413	61440.24	668	117366.53	350
35	52373.81	413	61480.32	668	117387.52	350
36	52398.59	413	61520.41	668	117408.52	350
37	52423.36	413	61560.52	669	117429.54	350
38	52448.13	413	61600.64	669	117450.58	351
39	52472.90	413	61640.77	669	117471.63	351
40	52497.66	413	61680.92	669	117492.70	351
41	52522.41	413	61721.08	670	117513.79	352
42	52547.16	412	61761.26	670	117534.90	352
43	52571.91	412	61801.45	670	117556.03	352
44	52596.65	412	61841.66	670	117577.17	353
45	52621.39	412	61881.88	670	117598.33	353
46	52646.13	412	61922.11	671	117619.50	353
47	52670.85	412	61962.36	671	117640.70	354
48	52695.58	412	62002.63	671	117661.91	354
49	52720.30	412	62042.91	671	117683.14	354
50	52745.01	412	62083.20	672	117704.39	354
51	52769.73	412	62123.51	672	117725.66	355
52	52794.43	412	62163.83	672	117746.94	355
53	52819.14	412	62204.17	672	117768.24	355
54	52843.83	412	62244.52	673	117789.56	355
55	52868.53	411	62284.88	673	117810.89	356
56	52893.22	411	62325.26	673	117832.25	356
57	52917.90	411	62365.66	673	117853.62	356
58	52942.58	411	62406.07	674	117875.01	357
59	52967.25	411	62446.59	674	117896.41	357
60	52991.93	411	62486.93	674	117917.84	357

58. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	85248.81	253	163078.67	1774	191297.29	1513
28	85233.60	254	162972.27	1773	191206.59	1511
27	85218.39	254	162865.97	1771	191116.00	1509
26	85203.16	254	162759.77	1769	191025.51	1507
25	85187.93	254	162653.68	1767	190935.12	1506
24	85172.69	254	162547.68	1766	190844.83	1504
23	85157.45	254	162441.78	1764	190754.64	1502
22	85142.19	254	162335.99	1763	190664.56	1501
21	85126.93	254	162230.29	1761	190574.57	1499
20	85111.67	254	162124.69	1759	190484.69	1497
19	85096.39	255	162019.20	1758	190394.90	1496
18	85081.11	255	161913.80	1756	190305.22	1494
17	85065.82	255	161808.50	1755	190215.64	1492
16	85050.53	255	161703.30	1753	190126.16	1491
15	85035.22	255	161598.20	1751	190036.78	1489
14	85019.91	255	161493.20	1749	189947.50	1487
13	85004.59	255	161388.29	1748	189858.32	1486
12	84989.27	255	161283.49	1746	189769.24	1484
11	84973.94	256	161178.78	1744	189680.26	1482
10	84958.60	256	161074.17	1743	189591.37	1481
9	84943.25	256	160969.66	1741	189502.59	1481
8	84927.90	256	160865.25	1740	189413.91	1477
7	84912.54	256	160760.94	1738	189325.32	1476
6	84897.17	256	160656.72	1736	189236.84	1474
5	84881.79	256	160552.60	1735	189148.45	1472
4	84866.41	256	160448.58	1733	189060.16	1471
3	84851.02	257	160344.65	1731	188971.97	1469
2	84835.62	257	160240.82	1730	188883.88	1468
1	84820.22	257	160137.09	1728	188795.89	1466
0	84804.81	257	160033.45	1727	188707.99	1464

32. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	53016.59	411	62527.39	674	117939.28	358
2	53041.25	411	62567.86	675	117960.74	358
3	53065.91	411	62608.34	675	117982.22	358
4	53090.56	411	62648.84	675	118003.72	358
5	53115.21	411	62689.35	675	118025.23	359
6	53139.86	411	62729.88	676	118046.76	359
7	53164.50	411	62770.42	676	118068.31	359
8	53189.13	411	62810.98	676	118089.88	359
9	53213.76	410	62851.55	676	118111.46	360
10	53238.39	.410	62892.15	677	118133.07	360
11	53263.01	410	62932.74	677	118154.69	360
12	53287.63	410	62973.36	677	118176.33	361
13	53312.24	410	63013.99	677	118197.98	361
14	53336.85	410	63054.64	678	118219.66	361
15	53361.45	410	63095.30	678	118241.35	361
16	53386.05	410	63135.98	678	118263.06	362
17	53410.64	410	63176.67	678	118284.79	362
18	53435.23	410	63217.38	679	118306.54	362
19	53459.82	410	63258.10	679	118328.30	363
20	53484.40	410	63298.83	679	118350.08	363
21	53508.98	410	63339.58	679	118371.88	363
22	53533.55	409	63380.35	680	118393.70	364
23	53558.12	409	63421.13	680	118415.54	364
24	53582.68	409	63461.93	680	118437.39	364
25	53607.24	409	63502.74	680	118459.27	364
26	53631.79	409	63543.57	681	118481.16	365
27	53656.34	409	63584.41	681	118503.07	365
28	53680.88	409	63625.27	681	118524. 9	365
29	53705.42	409	63666.14	681	118546. 9	366
30	53729.96	409	63707.03	682	118568. 9	366

57. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	84789.39	257	159929 91	1725	188620.19	1463
58	84773.97	257	159826.47	1723	188532.49	1461
57	84758.53	257	159723.12	1722	188444.89	1459
56	84743.09	257	159619.87	1720	188357.38	1458
55	84727.65	257	159516.72	1719	188269.97	1456
54	84712.19	258	159413.66	1717	188182.66	1455
53	84696.73	258	159310.70	1715	188095.45	1453
52	84681.26	258	159207.83	1714	188008.33	1451
51	84665.79	258	159105.05	1712	187921.31	1450
50	84650.30	258	159002.38	1711	187834.38	1448
49	84634.81	258	158899.79	1709	187747.55	1446
48	84619.32	258	158797.30	1707	187660.82	1445
47	84603.81	258	158694.91	1706	187574.18	1443
46	84588.30	259	158592.61	1704	187487.64	1442
45	84572.78	259	158490.41	1703	187401.20	1440
44	84557.26	259	158388.30	1701	187314.85	1438
43	84541.72	259	158286.28	1700	187228.59	1437
42	84526.18	259	158184.36	1698	187142.43	1435
41	84510 64	259	158082.53	1696	187056.37	1434
40	84495.08	259	157980.79	1695	186970.40	1432
39	84479.52	259	157879.15	1693	186884.53	1431
38	84463.95	260	157777.60	1692	186798.75	1429
37	84448.37	260	157676.15	1690	186713.06	1427
36	84432.79	260	157574.79	1689	186627.47	1425
35	84417.20	260	157473.52	1687	186541.97	1424
34	84401.60	260	157372.34	1686	186456.57	1423
33	84361.00	260	157271.26	1684	186371.26	1421
32	84370.39	260	157170.26	1683	186286.05	1420
31	84354.77	260	157069.36	1681	186200.93	1418
30	84339.14	260	156968.56	1679	186115.90	1416

32. Grad.

Prima	Sinus	10''	Tangens	10''	Secans	10''
31	53754.49	409	63747.93	682	118590.89	367
32	53779.02	409	63788.85	682	118612.89	367
33	53803.54	409	63829.78	682	118634.90	367
34	53828.06	409	63870.73	683	118656.94	367
35	53852.57	409	63911.69	683	118679.00	368
36	53877.08	408	63952.67	683	118701.07	368
37	53901.58	408	63993.66	683	118723.16	368
38	53926.08	408	64034.67	684	118745.27	369
39	53950.58	408	64075.69	684	118767.40	369
40	53975.07	408	64116.73	684	118789.54	369
41	53999.55	408	64157.79	684	118811.71	370
42	54024.03	408	64198.86	685	118833.89	370
43	54048.51	408	64239.94	685	118856.09	370
44	54072.98	408	64281.04	685	118878.31	370
45	54097.45	408	64322.16	685	118900.55	371
46	54121.91	408	64363.29	686	118922.80	371
47	54146.37	408	64404.44	686	118945.08	371
48	54170.82	408	64445.60	686	118967.37	372
49	54195.27	407	64486.78	686	118989.68	372
50	54219.71	407	64527.97	687	119012.01	372
51	54244.15	407	64569.18	687	119034.36	373
52	54268.59	407	64610.41	687	119056.73	373
53	54293.02	407	64651.65	687	119079.11	373
54	54317.44	407	64692.90	688	119101.52	374
55	54341.87	407	64734.17	688	119123.94	374
56	54366.28	407	64775.46	688	119146.38	374
57	54390.69	407	64816.76	688	119168.84	374
58	54415.10	407	64858.08	689	119191.32	375
59	54439.50	407	64899.41	689	119213.81	375
60	54463.90	407	64940.76	689	119236.33	375

57. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
29	84323.51	261	156867.84	1678	186030.96	1415
28	84307.87	261	156767.22	1676	185946.12	1413
27	84292.22	261	156666.69	1675	185861.38	1412
26	84276.57	261	156566.25	1673	185776.72	1410
25	84260.91	261	156465.90	1672	185692.16	1409
24	84245.24	261	156365.64	1670	185607.69	1407
23	84229.56	261	156265.48	1669	185523.31	1406
22	84213.88	261	156165.40	1667	185439.03	1404
21	84198.19	262	156065.42	1666	185354.83	1403
20	84182.49	262	155965.52	1664	185270.73	1401
19	84166.79	262	155865.72	1663	185186.72	1399
18	84151.08	262	155766.01	1661	185102.81	1398
17	84135.36	262	155666.39	1660	185018.98	1396
16	84119.63	262	155566.85	1658	184935.25	1395
15	84103.90	262	155467.41	1657	184851.61	1393
14	84088.16	262	155368.06	1655	184768.05	1392
13	84072.41	262	155268.80	1654	184684.59	1390
12	84056.66	263	155169.63	1652	184601.23	1389
11	84040.90	263	155070.54	1651	184517.95	1387
10	84025.13	263	154971.55	1649	184434.76	1386
9	84009.35	263	154872.64	1648	184351.66	1384
8	83993.57	263	154773.83	1646	184268.66	1383
7	83977.78	263	154675.10	1645	184185.74	1381
6	83961.99	263	154576.46	1643	184102.92	1380
5	83946.18	263	154477.91	1642	184020.18	1378
4	83930.37	264	154379.46	1640	183937.53	1377
3	83914.55	264	154281.08	1639	183854.98	1375
2	83898.73	264	154182.80	1637	183772.51	1374
1	83882.90	264	154084.60	1636	183690.13	1372
0	83867.06	264	153986.50	1635	183607.85	1371

33. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	54488.30	407	64982.12	690	119258.86	376
2	54512.69	406	65023.50	690	119281.41	376
3	54537.07	406	65064.90	690	119303.99	376
4	54561.45	406	65106.31	690	119326.58	377
5	54585.82	406	65147.74	691	119349.18	377
6	54610.20	406	65189.18	691	119371.81	377
7	54634.56	406	65230.64	691	119394.46	378
8	54658.92	406	65272.11	691	119417.12	378
9	54683.28	406	65313.60	692	119439.80	378
10	54707.63	406	65355.11	692	119462.50	379
11	54731.98	406	65396.63	692	119485.22	379
12	54756.32	406	65438.17	692	119507.96	379
13	54780.66	406	65479.72	693	119530.72	379
14	54804.99	406	65521.29	693	119553.50	380
15	54829.32	405	65562.87	693	119576.29	380
16	54853.65	405	65604.47	693	119599.11	380
17	54877.97	405	65646.09	694	119621.94	381
18	54902.28	405	65687.72	694	119644.79	381
19	54926.59	405	65729.37	694	119667.66	381
20	54950.90	405	65771.03	695	119690.55	382
21	54975.20	405	65812.71	695	119713.46	382
22	54999.49	405	65854.41	695	119736.39	382
23	55023.79	405	65896.12	695	119759.34	383
24	55048.07	405	65937.85	696	119782.30	383
25	55072.36	405	65979.59	696	119805.29	383
26	55096.63	405	66021.35	696	119828.29	384
27	55120.91	404	66063.13	696	119851.31	384
28	55145.18	404	66104.92	697	119874.35	384
29	55169.44	404	66146.73	697	119897.41	385
30	55193.70	404	66188.56	697	119920.49	385

56.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
59	83851.21	264	153888.48	1633	183525.65	1369
58	83835.36	264	153790.54	1632	183443.54	1368
57	83819.50	264	153692.70	1630	183361.52	1366
56	83803.63	265	153594.94	1629	183279.58	1365
55	83787.75	265	153497.27	1627	183197.74	1363
54	83771.87	265	153399.69	1626	183115.99	1362
53	83755.98	265	153302.19	1624	183034.32	1360
52	83740.09	265	153204.79	1623	182952.74	1359
51	83724.18	265	153107.46	1621	182871.25	1358
50	83708.27	265	153010.23	1620	182789.85	1356
49	83692.36	265	152913.08	1619	182708.54	1355
48	83676.43	265	152816.02	1617	182627.31	1353
47	83660.50	266	152719.04	1616	182546.17	1352
46	83644.56	266	152622.15	1614	182465.12	1350
45	83628.62	266	152525.35	1613	182384.16	1349
44	83612.66	266	152428.63	1611	182303.28	1347
43	83596.70	266	152332.00	1600	182222.49	1346
42	83580.74	266	152235.45	1609	182141.79	1344
41	83564.76	266	152138.99	1607	182061.18	1343
40	83548.78	266	152042.61	1606	181980.65	1342
39	83532.79	266	151946.32	1604	181900.21	1340
38	83516.80	267	151850.12	1603	181819.85	1339
37	83500.80	267	151754.00	1601	181739.58	1337
36	83484.79	267	151657.96	1600	181659.40	1336
35	83468.77	267	151562.01	1599	181570.30	1334
34	83452.75	267	151466.14	1597	181499.29	1333
33	83436.72	267	151370.36	1596	181410.36	1331
32	83420.68	267	151274.66	1594	181339.53	1330
31	83404.63	267	151179.05	1593	181259.77	1328
30	83388.58	268	151083.52	1592	181180.10	1327

33. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	55217.95	404	66230.40	697	119943.59	385
32	55242.20	404	66272.25	698	119966.71	385
33	55266.45	404	66314.13	698	119989.85	386
34	55290.69	404	66356.01	698	120013.00	386
35	55314.92	404	66397.92	699	120036.18	386
36	55339.15	404	66439.84	699	120059.37	387
37	55363.38	404	66481.78	699	120082.58	387
38	55387.60	404	66523.73	699	120105.82	387
39	55411.82	404	66565.70	700	120129.07	388
40	55436.03	403	66607.69	700	120152.34	388
41	55460.24	403	66649.69	700	120175.63	388
42	55484.44	403	66691.71	700	120198.94	389
43	55508.64	403	66733.74	701	120222.26	389
44	55532.83	403	66775.80	701	120245.61	389
45	55557.02	403	66817.86	701	120268.98	390
46	55581.21	403	66859.95	702	120292.36	390
47	55605.39	403	66902.05	702	120315.77	390
48	55629.56	403	66944.16	702	120339.19	391
49	55653.73	403	66986.30	702	120362.64	391
50	55677.90	403	67028.45	703	120386.10	391
51	55702.06	403	67070.61	703	120409.58	392
52	55726.21	403	67112.80	703	120433.08	392
53	55750.36	402	67154.99	703	120456.60	392
54	55774.51	402	67197.21	704	120480.14	393
55	55798.65	402	67239.44	704	120503.70	393
56	55822.79	402	67281.69	704	120527.28	393
57	55846.92	402	67323.96	705	120550.88	393
58	55871.05	402	67366.24	705	120574.50	394
59	55895.17	402	67408.54	705	120598.14	394
60	55919.29	402	67450.85	705	120621.79	394

56. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	0″
29	83372.52	268	150988.07	1581	181100.52	1326
28	83356.46	268	150892.71	1589	181021.02	1324
27	83340.38	268	150797.43	1587	180941.61	1323
26	83324.30	268	150702.24	1586	180862.28	1322
25	83308.22	268	150607.13	1585	180783.04	1320
24	83292.12	268	150512.10	1583	180703.88	1319
23	83276.02	268	150417.15	1582	180624.81	1317
22	83259.91	269	150322.29	1580	180545.82	1316
21	83243.80	269	150227.51	1579	180466.91	1314
20	83227.68	269	150132.82	1578	180388.09	1313
19	83211.55	269	150038.20	1576	180309.35	1312
18	83195.41	269	149943.67	1575	180230.70	1310
17	83179.27	269	149849.23	1574	189152.13	1309
16	83163.12	269	149754.86	1572	180073.65	1307
15	83146.96	269	149660.58	1571	179995.24	1306
14	83130.80	269	149566.37	1569	179916.93	1305
13	83114.62	270	149472.25	1568	179838.69	1303
12	83098.45	270	149378.22	1567	179760.54	1302
11	83082.26	270	149284.26	1565	179682.47	1301
10	83066.07	270	149190.39	1564	179604.48	1299
9	83049.87	270	149096.56	1563	179526.58	1298
8	83033.66	270	149002.88	1561	179448.76	1296
7	83017.45	270	148909.25	1560	179371.02	1295
6	83001.23	270	148815.70	1559	179293.37	1294
5	82985.00	271	148722.23	1557	179215.80	1293
4	82968.77	271	148628.84	1556	179138.31	1291
3	82952.52	271	148535.63	1555	179060.90	1290
2	82936.28	271	148442.31	1553	178983.57	1288
1	82920.02	271	148349.16	1552	178906.33	1287
0	82903.76	271	148256.10	1551	178829.16	1285

34. Grad.

Prima	Sinus	10″	Targens	10″	Secans	10″
1	55943.40	402	67493.18	706	120645.47	395
2	55967.51	402	67535.53	706	120669.17	395
3	55991.62	402	67577.90	706	120692.88	395
4	56015.71	402	67620.28	706	120716.62	396
5	56039.81	402	67662.67	707	120740.37	396
6	56063.90	401	67705.09	707	120764.15	396
7	56087.98	401	67747.52	707	120787.94	397
8	56112.06	401	67789.97	708	120811.75	397
9	56136.14	401	67832.43	708	120835.59	397
10	56160.21	401	67874.92	708	120859.44	398
11	56184.28	401	67917.41	708	120883.31	398
12	56208.34	401	67959.93	709	120907.20	398
13	56232.39	401	68002.46	709	120931.12	399
14	56256.45	401	68045.01	709	120955.05	399
15	56280.49	401	68087.58	710	120979.00	399
16	56304.53	401	68130.16	710	121002.97	400
17	56328.57	401	68172.76	710	121026.96	400
18	56352.60	400	68215.37	710	121050.97	400
19	56376.63	400	68258.01	711	121075.00	401
20	56400.66	400	68300.66	711	121099.05	401
21	56424.67	400	68343.33	711	121123.12	401
22	56448.69	400	68386.01	712	121147.21	402
23	56472.70	400	68428.71	712	121171.32	402
24	56496.70	400	68471.43	712	121195.45	402
25	56520.70	400	68514.16	712	121219.59	403
26	56544.69	400	68556.92	713	121243.77	403
27	56568.68	400	68699.69	713	121267.95	403
28	56592.67	400	68642.47	713	121292.16	404
29	56616.65	400	68685.27	714	121316.39	404
30	56640.62	400	68728.10	714	121340.64	404

55. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	82887.49	271	148163.11	1549	178752.08	1284
58	82871.21	271	148070.21	1548	178675.08	1283
57	82854.93	271	147977.38	1547	178598.17	1281
56	82838.64	272	147884.63	1545	178521.33	1280
55	82822.34	272	147791.97	1544	178444.57	1279
54	82806.03	272	147699.38	1543	178367.90	1277
53	82789.72	272	147606.88	1541	178291.31	1276
52	82773.40	272	147514.45	1540	178214.79	1275
51	82757.08	272	147422.10	1539	178138.36	1273
50	82740.74	272	147329.83	1537	178062.01	1272
49	82724.40	272	147237.64	1536	177985.74	1271
48	82708.06	272	147145.53	1535	177909.55	1269
47	82691.70	273	147053.50	1533	177833.44	1268
46	82675.34	273	146961.55	1532	177757.41	1267
45	82658.97	273	146869.67	1531	177681.46	1265
44	82642.60	273	146777.87	1529	177605.59	1264
43	82626.22	273	146686.16	1528	177529.80	1263
42	82609.83	273	146594.52	1527	177454.09	1261
41	82593.43	273	146902.96	1525	177378.45	1260
40	82577.03	273	146411.47	1524	177302.90	1259
39	82560.62	274	146320.07	1523	177227.43	1257
38	82544.20	274	146228.74	1522	177152.04	1256
37	82527.78	274	146137.49	1520	177076.72	1255
36	82511.35	274	146046.32	1519	177001.49	1253
35	82494.91	274	145955.22	1518	176926.33	1252
34	82478.47	274	145864.20	1516	176851.25	1251
33	82462.02	274	145773.26	1515	176776.25	1249
32	82445.56	274	145682.40	1514	176701.33	1248
31	82429.09	274	145591.61	1513	176626.49	1247
30	82412.62	275	145500.90	1511	176551.73	1245

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34. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	56664.59	399	68770.93	714	121364.91	405
32	56688.56	399	68813.79	714	121389.20	405
33	56712.52	399	68856.66	715	121413.51	405
34	56736.48	399	68899.55	715	121437.83	496
35	56760.43	399	68942.46	715	121462.18	406
36	56784.37	399	68985.38	716	121486.55	406
37	56808.32	399	69028.32	716	121510.94	407
38	56832.25	399	69071.28	716	121535.35	407
39	56856.18	399	69114.25	716	121559.78	407
40	56880.11	399	69157.25	717	121584.23	408
41	56904.03	399	69200.26	717	121608.70	408
42	56927.95	399	69243.28	717	121633.19	408
43	56951.86	398	69286.33	718	121657.70	499
44	56975.77	398	69329.39	718	121682.23	409
45	56999.68	398	69372.47	718	121706.78	409
46	57023.57	398	69415.56	718	121731.35	410
47	57047.47	398	69458.68	719	121755.94	410
48	57071.36	398	69501.81	719	121780.55	410
49	57095.24	398	69544.96	719	121805.18	411
50	57119.12	398	69588.12	720	121829.83	411
51	57142.99	398	69631.31	720	121854.50	411
52	57166.86	398	69674.51	720	121879.19	412
53	57190.73	398	69717.73	720	121903.90	412
54	57214.59	398	69760.97	721	121928.64	412
55	57238.44	398	69804.22	721	121953.39	413
56	57262.29	397	69847.49	721	121978.16	413
57	57286.14	397	69890.78	722	122002.96	413
58	57309.98	397	69934.09	722	122027.77	414
59	57333.81	397	69977.41	722	122052.60	414
60	57357.64	397	70020.75	723	122077.46	414

55. Grad.

Prima	Sinus	10''	Tangens	10''	Secans	6''
29	82396.14	275	145410.27	1510	176477.04	1244
28	82379.65	275	145319.71	1509	176402.43	1243
27	82363.16	275	145229.23	1507	176327.91	1242
26	82346.66	275	145138.83	1506	176253.45	1240
25	82330.15	275	145048.50	1505	176179.08	1239
24	82313.64	275	144958.25	1504	176104.78	1238
23	82297.11	275	144868.08	1502	176030.56	1236
22	82280.59	276	144777.98	1501	175956.42	1235
21	82264.05	276	144687.96	1500	175882.36	1234
20	82247.51	276	144598.01	1499	175808.37	1233
19	82230.96	276	144508.14	1497	175734.46	1231
18	82214.40	276	144418.34	1496	175660.65	1230
17	82197.84	276	144328.62	1495	175586.87	1228
16	82181.27	276	144238.97	1494	175513.19	1227
15	82164.69	276	144149.40	1492	175439.59	1226
14	82148.11	276	144059.91	1491	175366.07	1225
13	82131.52	277	143970.49	1490	175292.62	1224
12	82114.92	277	143881.14	1489	175219.24	1222
11	82098.32	277	143791.87	1487	175145.95	1221
10	82081.70	277	143702.68	1486	175072.73	1220
9	82065.08	277	143613.56	1485	174999.58	1219
8	82048.46	277	143524.51	1484	174926.51	1217
7	82031.83	277	143435.54	1482	174853.52	1216
6	82015.19	277	143346.64	1481	174780.60	1215
5	81998.54	277	143257.81	1480	174707.76	1213
4	81981.89	278	143169.06	1479	174634.99	1212
3	81965.23	278	143080.39	1477	174562.30	1211
2	81948.56	278	142991.78	1476	174489.69	1210
1	81931.89	278	142903.26	1475	174417.14	1208
0	81915.20	278	142814.80	1474	174344.68	1207

35. Grad.

Prima	Sinus	10″	Targens	10″	Secans	10″
1	57381.47	397	70064.11	723	122102.33	415
2	57405.29	397	70107.49	723	122127.23	415
3	57429.11	397	70150.89	723	122152.15	415
4	57452.92	397	70194.30	724	122177.03	416
5	57476.72	397	70237.73	724	122202.04	416
6	57500.52	397	70281.18	724	122227.02	416
7	57524.32	397	70324.64	725	122252.02	417
8	57548.11	396	70368.13	725	122277.03	417
9	57571.90	396	70411.63	725	122302.07	418
10	57595.68	396	70455.15	725	122327.13	418
11	57619.46	396	70498.68	726	122352.21	418
12	57643.23	396	70542.24	726	122377.32	419
13	57667.00	396	70585.81	726	122402.44	419
14	57690.76	396	70629.40	727	122427.58	419
15	57714.52	396	70673.01	727	122452.74	420
16	57738.27	396	70716.64	727	122477.93	420
17	57762.02	396	70760.28	728	122503.13	420
18	57785.76	396	70807.95	728	122528.36	421
19	57809.50	396	70847.63	728	122553.61	421
20	57833.23	395	70891.33	728	122578.87	421
21	57856 96	385	70935.04	729	122604.16	422
22	57880.68	395	70978.78	729	122629.47	422
23	57904.40	395	71022.53	729	122654.80	422
24	57928.12	395	71066.30	730	122680.15	423
25	57951.83	395	71110.09	730	122705.52	423
26	57975.53	395	71153.90	730	122730.91	423
27	57999.23	395	71197.72	731	122756.33	424
28	58022.92	395	71241.56	731	122781.76	424
29	58046.61	395	71285.43	731	122807.21	424
30	58070.29	395	71329.31	731	122832.69	425

54. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	81898.52	278	142736.42	1473	174272.29	1206
58	81881.82	278	142638.11	1472	174199.97	1205
57	81865.12	278	142549.87	1471	174127.73	1203
56	81848.41	279	142461.71	1469	174055.56	1202
55	81831.69	279	142373.62	1468	173983.47	1201
54	81814.97	279	142285.61	1466	173911.45	1200
53	81798.24	279	142197.66	1465	173839.51	1199
52	81781.50	279	142109.79	1464	173767.64	1197
51	81764.76	279	142022.00	1463	173695.85	1196
50	81748.01	279	141934.27	1462	173624.13	1195
49	81731.25	279	141846.62	1460	173552.48	1194
48	81714.49	279	141759.04	1459	173480.90	1192
47	81697.72	280	141671.53	1458	173409.40	1191
46	81680.94	280	141584.09	1456	173337.98	1190
45	81664.15	280	141496.73	1456	173266.63	1189
44	81647.36	280	141409.43	1454	173195.35	1187
43	81630.56	280	141322.21	1453	173124.14	1186
42	81613.76	280	141235.06	1452	173053.01	1185
41	81596.95	280	141147.99	1451	172981.95	1184
40	81580.13	280	141060.98	1450	172910.96	1183
39	81563.30	280	140974.05	1448	172840.05	1181
38	81546.47	281	140887.18	1447	172769.21	1180
37	81529.63	281	140800.39	1446	172698.44	1179
36	81512.78	281	140713.67	1445	172627.74	1178
35	81495.92	281	140627.02	1444	172557.12	1177
34	81479.06	281	140540.44	1442	172486.57	1175
33	81462.20	281	140453.93	1441	172416.09	1174
32	81445.32	281	140367.49	1440	172345.68	1173
31	81428.44	281	140281.13	1439	172275.34	1172
30	81411.55	282	140194.83	1438	172205.08	1171

35. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	58093.97	395	71373.20	732	122858.19	425
32	58117.65	395	71417.12	732	122883.71	425
33	58141.32	394	71461.05	732	122909.24	426
34	58164.98	394	71505.01	733	122934.80	426
35	58188.64	394	71548.98	733	122960.38	427
36	58212.30	394	71592.97	733	122985.99	427
37	58235.95	394	71636.98	734	123011.61	427
38	58259.59	394	71681.00	734	123037.25	428
39	58283.23	394	71725.05	734	123062.92	428
40	58306.87	394	71769.11	735	123088.61	428
41	58330.50	394	71813.19	735	123114.32	429
42	58354.12	394	71857.29	735	123140.04	429
43	58377.74	394	71901.41	735	123165.79	429
44	58401.36	394	71945.54	736	123191.56	430
45	58424.97	393	71989.70	736	123217.36	430
46	58448.57	393	72033.87	736	123243.17	430
47	58472.17	393	72078.06	737	123269.00	431
48	58405.77	393	72122.27	737	123294.86	431
49	58519.36	393	72166.50	737	123320.74	431
50	58542.94	393	72210.75	738	123346.64	432
51	58566.52	393	72255.02	738	123372.56	432
52	58590.10	393	72299.30	738	123398.50	433
53	58613.67	393	72343.61	739	123424.46	433
54	58637.24	393	72387.93	739	123450.44	433
55	58660.80	393	72432.27	739	123476.45	434
56	58684.35	393	72476.63	739	123502.48	434
57	58707.90	392	72521.01	740	123528.52	434
58	58731.45	392	72565.40	740	123554.59	435
59	58754.99	392	72609.82	740	123580.68	435
60	58778.52	392	72654.25	741	123606.80	435

54. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	81394.66	282	140108.6[illegible]	1437	172134.89	1169
28	81377.75	282	140022.45	1436	172064.77	1168
27	81360.84	282	139936.36	1434	171994.72	1167
26	81343.93	282	139850.34	1433	171924.75	1166
25	81327.01	282	139764.40	1432	171854.84	1165
24	81310.08	282	139678.52	1431	171785.01	1163
23	81293.14	282	139592.71	1430	171715.25	1162
22	81276.20	282	139506.98	1428	171645.56	1161
21	81259.24	283	139421.31	1427	171575.94	1160
20	81242.29	283	139335.71	1426	171506.39	1159
19	81225.32	283	139250.18	1425	171436.91	1157
18	81208.35	283	139164.73	1424	171367.50	1156
17	81191.37	283	139079.34	1423	171298.17	1155
16	81174.39	283	138994.01	1422	171228.90	1154
15	81157.40	283	138908.76	1420	171159.70	1153
14	81140.40	283	138823.58	1419	171090.58	1152
13	81123.39	283	138738.46	1418	171021.52	1150
12	81106.38	284	138653.42	1417	170952.54	1149
11	81089.36	284	138568.44	1416	170883.62	1148
10	81072.34	284	138483.53	1415	170814.78	1147
9	81055.30	284	138398.69	1414	170746.00	1146
8	81038.26	284	138313.92	1412	170677.30	1145
7	81021.22	284	138229.22	1411	170608.66	1144
6	81004.16	284	138144.58	1410	170540.10	1142
5	80987.10	284	138060.01	1409	170471.60	1141
4	80970.04	284	137975.51	1408	170403.18	1140
3	80952.96	285	137891.08	1407	170334.82	1139
2	80935.88	285	137806.72	1406	170266.53	1138
1	80918.79	285	137722.42	1404	170198.31	1137
0	80901.70	285	137638.19	1403	170130.16	1135

36. Grad.

Prim.	Sinus	10″	Tangens	10″	Secans	10″
1	58802.06	392	72698.71	741	123632.93	436
2	58825.58	392	72743.18	741	123659.09	436
3	58849.10	392	72787.67	742	123685.26	436
4	58872.62	392	72832.18	742	123711.46	437
5	58896.13	392	72876.71	742	123737.68	437
6	58919.64	392	72921.25	743	123763.93	437
7	58943.14	392	72965.82	743	123790.19	438
8	58966.63	392	73010.41	743	123816.47	438
9	58990.12	391	73055.01	744	123842.78	439
10	59013.61	391	73099.63	744	123869.11	439
11	59037.09	391	73144.27	744	123895.46	439
12	59060.57	391	73188.94	745	123921.83	440
13	59084.04	391	73233.62	745	123948.22	440
14	59107.50	391	73278.31	745	123974.64	440
15	59130.96	391	73323.03	745	124001.08	441
16	59154.42	391	73367.77	746	124027.54	441
17	59177.87	391	73412.53	746	124054.02	441
18	59201.32	391	73457.30	746	124080.52	442
19	59224.76	391	73502.10	747	124107.04	442
20	59248.19	391	73546.91	747	124133.59	442
21	59271.63	390	73591.74	747	124160.16	443
22	59295.05	390	73636.60	748	124186.75	443
23	59318.47	390	73681.47	748	124213.36	443
24	59341.89	390	73726.36	748	124239.99	444
25	59365.30	390	73771.27	749	124266.65	444
26	59388.70	390	73816.20	749	124293.33	445
27	59412.11	390	73861.15	749	124320.03	445
28	59435.50	390	73906.11	750	124346.75	446
29	59458.89	390	73951.18	750	124373.49	446
30	59482.28	390	73996.11	750	124400.26	446

53. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
59	80884.60	285	137554.03	1402	170062.08	1134
58	80867.49	285	137469.94	1401	169994.07	1133
57	80850.37	285	137385.91	1400	169926.12	1132
56	80833.25	285	137301.95	1399	169858.25	1131
55	80816.12	286	137218.05	1399	169790.44	1130
54	80798.99	286	137134.23	1397	169722.71	1128
53	80781.85	286	137050.47	1396	169655.04	1127
52	80764.70	286	136966.78	1394	169587.43	1126
51	80747.54	286	136883.15	1393	169519.90	1125
50	80730.38	286	136799.59	1392	169452.44	1124
49	80713.21	286	136716.10	1391	169385.04	1123
48	80696.03	286	136632.67	1390	169317.71	1122
47	80678.85	286	136549.31	1389	169250.45	1121
46	80661.66	287	136466.02	1388	169183.26	1119
45	80644.46	287	136382.79	1387	169116.13	1118
44	80627.26	287	136299.63	1386	169049.07	1117
43	80610.05	287	136216.53	1384	168982.08	1116
42	80592.83	287	136133.50	1383	168915.16	1115
41	80575.60	287	136050.54	1382	168848.30	1114
40	80558.37	287	135967.64	1381	168781.51	1113
39	80541.13	287	135884.81	1380	168714.79	1112
38	80523.89	287	135802.04	1379	168648.14	1110
37	80506.64	288	135719.34	1378	168581.55	1109
36	80489.38	288	135636.70	1377	168515.03	1108
35	80472.11	288	135554.13	1376	168448.57	1107
34	80454.84	288	135471.62	1375	168382.18	1106
33	80437.56	288	135389.18	1374	168315.86	1105
32	80420.28	288	135306.80	1372	168249.61	1104
31	80402.98	288	135224.49	1371	168183.42	1103
30	80385.69	288	135142.24	1370	168117.30	1102

36. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	59505.66	390	74041.13	751	124427.04	447
32	59529.03	390	74086.18	751	124453.85	447
33	59552.41	389	74131.24	751	124480.69	447
34	59575.77	389	74176.33	752	124507.54	448
35	59599.13	389	74221.43	752	124534.42	448
36	59622.46	389	74266.55	752	124561.31	449
37	59645.84	389	74311.70	753	124588.23	449
38	59659.18	389	74356.86	753	124615.18	449
39	59692.52	389	74402.04	753	124642.14	450
40	59715.86	389	74447.24	754	124669.13	450
41	59739.19	389	74492.46	754	124696.14	450
42	59762.51	389	74537.70	754	124723.17	451
43	59785.83	389	74582.96	755	124750.22	451
44	59809.15	389	74628.24	755	124777.30	451
45	59832.46	388	74673.54	755	124804.40	452
46	59855.76	388	74718.86	755	124831.52	452
47	59879.06	388	74764.20	756	124858.66	453
48	59902.36	388	74809.56	756	124885.83	453
49	59925.65	388	74854.94	756	124913.01	453
50	59948.93	388	74900.33	757	124940.23	454
51	59972.21	388	74945.75	757	124967.46	454
52	59995.49	388	74991.19	757	124994.71	454
53	60018.76	388	75036.65	758	125021.99	455
54	60042.02	388	75082.12	758	125049.29	455
55	60065.28	388	75127.62	758	125076.61	456
56	60088.54	388	75173.14	759	125103.96	456
57	60111.78	387	75218.67	759	125131.33	456
58	60135.03	387	75264.23	759	125158.72	457
59	60158.27	387	75309.81	760	125186.13	457
60	60181.50	387	75355.40	760	125213.57	457

458

53. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	80368.38	288	135060.06	1369	168051.24	1100
28	80351.07	289	134977.94	1368	167985.25	1099
27	80333.75	289	134895.89	1367	167919.33	1098
26	80316.42	289	134813.90	1366	167853.47	1097
25	80299.09	289	134731.97	1365	167787.68	1096
24	80281.75	289	134650.11	1364	167721.95	1095
23	80264.40	289	134568.32	1363	167656.29	1094
22	80247.05	289	134486.58	1362	167590.70	1093
21	80229.69	289	134404.92	1361	167525.17	1092
20	80212.32	289	134323.31	1360	167459.70	1091
19	80194.94	290	134241.77	1359	167394.30	1090
18	80177.56	290	134160.29	1358	167328.97	1088
17	80160.18	290	134078.88	1356	167263.70	1087
16	80142.78	290	133997.53	1355	167198.50	1086
15	80125.38	290	133916.24	1354	167133.36	1085
14	80107.97	290	133835.02	1353	167068.28	1084
13	80090.56	290	133753.86	1352	167003.28	1083
12	80073.14	290	133672.76	1351	166938.33	1082
11	80055.71	291	133591.72	1350	166873.45	1081
10	80038.27	291	133510.75	1349	166808.64	1080
9	80020.83	291	133429.84	1348	166743.89	1079
8	80003.38	291	133349.00	1347	166679.20	1078
7	79985.93	291	133268.22	1346	166614.58	1077
6	79968.47	291	133187.49	1345	166550.02	1076
5	79951.00	291	133106.84	1344	166485.52	1074
4	79933.52	291	133026.24	1343	166421.09	1073
3	79916.04	291	132945.71	1342	166356.73	1072
2	79898.55	292	132865.24	1341	166292.43	1071
1	79881.05	292	132784.83	1340	166228.19	1070
0	79863.55	292	132704.48	1339	166164.01	1069

37. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	60204.73	387	75401.02	760	125241.02	458
2	60227.95	387	75446.66	761	125268.50	458
3	60251.17	387	75492.31	761	125296.01	459
4	60274.39	387	75537.99	761	125323.53	459
5	60297.59	387	75583.69	762	125351.08	459
6	60320.80	387	75629.41	762	125378.65	460
7	60344.00	387	75675.14	762	125406.25	460
8	60367.19	386	75720.90	763	125433.87	460
9	60390.38	386	75766.68	763	125461.51	461
10	60413.56	386	75812.47	763	125489.17	461
11	60436.74	386	75858.29	764	125516.85	462
12	60459.91	386	75904.13	764	125544.56	462
13	60483.08	386	75949.99	764	125572.29	462
14	60506.24	386	75995.87	765	125600.05	463
15	60529.40	386	76041.77	765	125627.82	463
16	60552.55	386	76087.69	765	125655.62	464
17	60575.70	386	76133.63	766	125683.45	464
18	60598.84	386	76179.58	766	125711.29	464
19	60621.98	386	76225.57	767	125739.16	465
20	60645.11	385	76271.57	767	125767.05	465
21	60668.23	385	76317.59	767	125794.97	465
22	60691.36	385	76363.63	768	125822.91	466
23	60714.47	385	76409.69	768	125850.87	466
24	60737.58	385	76455.77	768	125878.85	467
25	60760.69	385	76501.88	769	125906.86	467
26	60783.79	385	76548.00	769	125934.89	467
27	60806.89	385	76594.14	769	125962.94	468
28	60829.98	385	76640.31	770	125991.02	468
29	60853.06	385	76686.49	770	126019.12	469
30	60876.14	385	76732.70	770	126047.24	469

52. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
59	79846.04	292	132624.20	1338	166099.90	1068
58	79828.52	292	132543.97	1337	166035.85	1067
57	79811.00	292	132463.81	1336	165971.87	1066
56	79793.47	292	132383.71	1335	165907.95	1065
55	79775.94	292	132303.68	1334	165844.09	1064
54	79758.39	292	132223.70	1332	165780.30	1063
53	79740.84	293	132143.79	1331	165716.57	1062
52	79723.29	293	132063.93	1330	165652.90	1061
51	79705.72	293	131984.14	1329	165589.29	1060
50	79688.15	293	131904.41	1328	165525.75	1059
49	79670.57	293	131824.74	1327	165462.27	1058
48	79652.99	293	131745.13	1326	165398.85	1056
47	79635.40	293	131665.59	1325	165335.50	1055
46	79617.80	293	131586.10	1324	165272.21	1054
45	79600.20	293	131506.68	1323	165208.98	1053
44	79582.59	294	131427.31	1322	165145.81	1052
43	79564.97	294	131348.01	1321	165082.70	1051
42	79547.35	294	131268.76	1320	165019.66	1050
41	79529.72	294	131189.58	1319	164956.68	1049
40	79512.08	294	131110.46	1318	164893.76	1048
39	79494.43	294	131031.39	1317	164830.90	1047
38	79476.78	294	130952.40	1316	164768.11	1046
37	79459.13	294	130873.45	1315	164705.37	1045
36	79441.46	294	130794.57	1314	164642.70	1044
35	79423.79	295	130715.75	1313	164580.09	1043
34	79406.11	295	130636.99	1312	164517.54	1042
33	79388.43	295	130558.28	1311	164455.06	1041
32	79370.74	295	130479.64	1310	164392.63	1040
31	79353.04	295	130401.06	1309	164330.27	1039
30	79335.33	295	130322.54	1308	164267.96	1038

37. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	60899.22	385	76778.92	771	126075.39	469
32	60922.29	384	76825.17	771	126103.56	470
33	60945.35	384	76871.44	771	126131.75	470
34	60968.41	384	76917.73	772	126159.97	470
35	60991.47	384	76964.04	772	126188.20	471
36	61014.52	384	77010.37	772	126216.47	471
37	61037.56	384	77056.72	773	126244.75	472
38	61060.60	384	77103.09	773	126273.06	472
39	61083.63	384	77149.48	773	126301.39	472
40	61106.66	384	77195.89	774	126329.75	473
41	61129.69	384	77242.33	774	126358.13	473
42	61152.70	384	77288.78	774	126386.53	474
43	61175.72	383	77335.26	775	126414.96	474
44	61198.72	383	77381.75	775	126443.41	474
45	61221.73	383	77428.27	775	126471.88	475
46	61244.73	383	77474.81	776	126500.38	475
47	61267.72	383	77521.37	776	126528.90	476
48	61290.70	383	77567.95	777	126557.45	476
49	61313.69	383	77614.55	777	126586.01	476
50	61336.66	383	77661.17	777	126614.60	477
51	61359.64	383	77707.82	778	126643.22	477
52	61382.60	383	77754.48	778	126671.86	478
53	61405.56	383	77801.17	778	126700.52	478
54	61428.52	383	77847.88	779	126729.21	478
55	61451.47	382	77894.60	779	126757.92	479
56	61474.42	382	77941.35	779	126786.65	479
57	61497.36	382	77988.12	780	126815.41	480
58	61520.29	382	78034.91	780	126844.19	480
59	61543.22	382	78081.73	780	126872.99	480
60	61566.15	382	78128.56	781	126901.82	481

52.Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
29	79317.62	295	130244.07	1307	164205.72	1037
28	79299.90	295	130165.67	1306	164143.54	1036
27	79282.18	295	130087.32	1305	164081.42	1035
26	79264.45	296	130009.04	1304	164019.36	1034
25	79246.91	296	129930.81	1303	163957.36	1033
24	79228.96	296	129852.65	1302	163895.42	1032
23	79211.21	296	129774.54	1301	163833.55	1031
22	79193.45	296	129696.49	1300	163771.73	1030
21	79175.69	296	129618.50	1299	163709.97	1029
20	79157.92	296	129540.57	1298	163648.28	1028
19	79140.14	296	129462.69	1297	163586.64	1027
18	79122.35	296	129384.88	1296	163525.07	1026
17	79104.56	297	129307.12	1295	163463.55	1025
16	79086.76	297	129229.34	1294	163402.10	1024
15	79068.96	297	129151.79	1294	163340.70	1023
14	79051.14	297	129074.21	1293	163279.37	1022
13	79033.33	297	128996.69	1292	163218.09	1021
12	79015.50	297	128919.22	1291	163156.88	1020
11	78996.67	297	128841.82	1290	163095.72	1019
10	78979.33	297	128764.47	1289	163034.62	1018
9	78961.98	297	128687.18	1288	162973.59	1017
8	78944.13	298	128609.95	1287	162612.61	1016
7	78926.27	298	128532.77	1286	162851.69	1015
6	78908.41	298	128455.66	1285	162790.83	1014
5	78890.54	298	128378.60	1284	162730.03	1013
4	78872.66	298	128401.60	1283	162669.29	1012
3	78854.77	298	128224.66	1282	162608.61	1011
2	78836.88	298	128147.76	1281	162547.99	1010
1	78818.98	298	128070.93	1280	162487.43	1009
0	78801.07	298	127994.16	1279	162426.92	1008

38. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	61589.07	382	78175.42	781	126930.67	481
2	61611.98	382	78222.29	781	126959.55	481
3	61634.89	382	78269.19	782	126988.45	482
4	61657.79	382	78316.11	782	127017.37	482
5	61680.69	382	78363.05	783	127046.32	483
6	61703.59	382	78410.02	783	127075.29	483
7	61726.48	381	78457.00	783	127104.29	483
8	61749.36	381	78504.00	784	127133.31	484
9	61772.24	381	78551.03	784	127162.35	484
10	61795.11	381	78598.08	784	127191.42	485
11	61817.98	381	78645.15	785	127220.51	485
12	61840.84	381	78692.24	785	127249.63	485
13	61863.70	381	78739.35	785	127278.77	486
14	61886.55	381	78786.49	786	127307.94	486
15	61909.39	381	78833.64	786	127337.12	487
16	61932.24	381	78880.82	786	127366.34	487
17	61955.07	381	78928.02	787	127395.57	488
18	61977.90	380	78975.24	787	127424.84	488
19	62000.73	380	79022.48	788	127454.12	488
20	62023.55	380	79069.75	788	127483.43	489
21	62046.36	380	79117.03	788	127512.76	489
22	62069.17	380	79164.34	789	127542.12	490
23	62091.98	380	79211.67	789	127571.50	490
24	62114.78	380	79259.02	789	127600.91	490
25	62137 57	380	79306.40	790	127630.34	491
26	62160.36	380	79353.79	790	127659.80	491
27	62183.14	380	79401.21	790	127689.28	492
28	62205.92	380	79448.65	791	127718.78	492
29	62228.70	379	79496.11	791	127748.31	492
30	62251.46	379	79543.59	792	127777.87	493

51. Grad.

Prima	Sinus	10''	Tangens	10''	Secans	10''
59	78783.16	299	127917.45	1278	162366.48	1007
58	78765.24	299	127840.79	1277	162306.09	1006
57	78747.32	299	127764.19	1276	162245.76	1005
56	78729.39	299	127687.64	1275	162185.49	1004
55	78711.45	299	127611.16	1274	162125.28	1003
54	78693.50	299	127534.73	1273	162065.13	1002
53	78675.55	299	127458.36	1272	162005.04	1001
52	78657.59	299	127382.04	1271	161945.00	1000
51	78639.63	299	127305.78	1270	161885.02	999
50	78621.65	210	127229.57	1269	161825.10	998
49	78603.67	210	127153.41	1269	161765.24	997
48	78585.69	210	127077.33	1268	161705.44	996
47	78567.70	210	127001.30	1267	161645.69	995
46	78549.70	310	126925.32	1266	161586.00	994
45	78531.69	300	126849.39	1265	161526.37	993
44	78513.68	300	126773.53	1264	161466.80	992
43	78495.66	300	126697.72	1263	161407.28	992
42	78477.64	300	126621.96	1262	161347.83	990
41	78459.61	301	126546.26	1261	161288.43	990
40	78441.57	301	126470.62	1260	161229.08	989
39	78423.52	301	126395.03	1259	161169.80	988
38	78405.47	301	126319.50	1258	161110.57	986
37	78387.41	301	126244.02	1258	161051.40	986
36	78369.35	301	126168.60	1257	160992.28	985
35	78351.27	301	126093.23	1256	160933.23	984
34	78333.19	301	126017.92	1255	160874.23	983
33	78315.11	301	125942.67	1254	160815.28	982
32	78297.02	302	125867.47	1253	160756.40	981
31	78278.92	302	125792.32	1252	160697.57	980
30	78260.82	302	125717.23	1251	160638.79	979

38. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	62274.23	379	79591.10	792	127807.44	494
32	62296.98	379	79638.62	792	127837.05	494
33	62319.73	379	79686.17	793	127866.67	494
34	62342.48	379	79733.74	793	127896.32	495
35	62365.22	379	79781.34	793	127926.00	495
36	62387.96	379	79828.95	794	127955.70	495
37	62410.69	379	79876.59	794	127985.43	496
38	62433.42	379	79924.25	795	128015.18	496
39	62456.14	379	79971.93	795	128044.95	496
40	62478.85	379	80019.63	795	128074.75	497
41	62501.56	378	80067.36	796	128104.57	497
42	62524.27	378	80115.11	796	128134.42	498
43	62546.96	378	80162.88	796	128164.30	498
44	62569.66	378	80210.67	797	128194.19	499
45	62592.35	378	80258.48	797	128224.12	499
46	62615.03	378	80306.32	797	128254.07	499
47	62637.71	378	80354.18	798	128284.04	500
48	62660.38	378	80402.06	798	128314.04	500
49	62683.05	378	80449.97	799	128344.06	501
50	62705.71	378	80497.90	799	128374.11	501
51	62728.37	378	80545.84	799	128404.18	501
52	62751.02	377	80593.82	800	128434.28	502
53	62773.66	377	80641.81	800	128464.40	502
54	62796.31	377	80689.83	800	128494.55	503
55	62818.94	377	80737.87	801	128524.72	503
56	62841.57	377	80785.93	801	128554.92	504
57	62864.20	377	80834.01	802	128585.14	504
58	62886.82	377	80882.12	802	128615.39	504
59	62909.43	377	80930.25	802	128645.66	505
60	62932.04	377	80978.40	803	128675.96	505

51.Grad.

Prima	Sinus	10''	Tangens	10''	Secans	10''
29	78242.70	302	125642.19	1250	160580.08	978
28	78224.59	302	125567.21	1249	160521.42	977
27	78206.46	302	125492.29	1248	160462.81	976
26	78188.33	302	125417.42	1247	160404.26	975
25	78170.19	302	125342.60	1246	160345.77	974
24	78152.05	302	125267.84	1245	160287.34	974
23	78133.90	303	125193.13	1244	160228.96	973
22	78115.74	303	125118.47	1243	160170.64	972
21	78077.57	303	125043.88	1242	160112.37	971
20	78079 40	303	124969.33	1242	160054.16	970
19	78061.22	303	124894.84	1241	159996.00	969
18	78043.04	303	124820.40	1240	159937.90	968
17	78024.85	303	124746.02	1239	159879.86	967
16	78006.65	303	124671.69	1238	159821.87	966
15	77988.45	303	124597.42	1237	159763.94	965
14	77970.24	304	124523.20	1237	159706.06	964
13	77952.02	304	124449.03	1236	159648.24	963
12	77933.80	304	124374.92	1235	159590.47	962
11	77915.57	304	124300.86	1234	159532.76	961
10	77897.33	304	124226.85	1233	159475.11	961
9	77879.08	304	124152.90	1232	159417.51	960
8	77860.83	304	124079.00	1231	159359.96	959
7	77842.58	304	124005.15	1230	159302.47	958
6	77824.31	304	123931.36	1229	159245.04	957
5	77806.04	305	123857.62	1229	159187.66	956
4	77787.77	305	123783.93	1228	159130.33	955
3	77769.48	305	123710.30	1227	159073.06	954
2	77751.19	305	123636.72	1226	159015.84	953
1	77732.90	305	123563.19	1225	158958.68	952
0	77714.60	305	123489.72	1224	158901.57	951

39. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	62954.64	377	81026.58	803	128706.28	506
2	62977.24	377	81074.78	803	128736.63	506
3	62999.83	376	81123.00	804	128767.00	506
4	63022.42	376	81171.24	804	128797.40	507
5	63045.00	376	81219.51	805	128827.82	507
6	63067.58	376	81267.79	805	128858.27	508
7	63090.15	376	81316.11	805	128888.75	508
8	63112.72	376	81364.44	806	128919.25	509
9	63135.28	376	81412.80	806	128949.77	509
10	63157.83	376	81461.18	807	128980.32	509
11	63180.38	376	81509.58	807	129010.90	510
12	63202.93	376	81558.01	807	129041.50	510
13	63225.47	376	81606.46	808	129072.13	511
14	63248.00	376	81654.93	808	129102.78	511
15	63270.53	375	81703.43	808	129133.46	512
16	63293.06	375	81751.94	809	129164.16	512
17	63315.57	375	81800.49	809	129194.89	512
18	63338.09	375	81849.05	810	129225.64	513
19	63360.59	375	81897.64	810	129256.42	513
20	63383.10	375	81946.25	810	129287.23	514
21	63405.59	375	81994.88	811	129318.06	514
22	63428.08	375	82043.54	811	129348.92	515
23	63450.57	375	82092.22	812	129379.80	515
24	63473.05	375	82140.93	812	129410.71	515
25	63495.53	375	82189.65	812	129441.64	516
26	63518.00	374	82238.40	813	129472.60	516
27	63540.46	374	82287.18	813	129503.59	517
28	63562.92	374	82335.97	813	129534.60	517
29	63585.37	374	82384.79	814	129565.64	518
30	63607.82	374	82433.64	814	129596.70	518

50. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	77696.29	305	123416.29	1223	158844.52	950
58	77677.97	305	123342.92	1222	158787.52	950
57	77659.65	305	123269.61	1222	158730.58	949
56	77641.32	306	123196.34	1221	158673.69	948
55	77622.98	306	123123.13	1220	158616.85	947
54	77604.64	306	123049.97	1219	158560.07	946
53	77586.29	306	122976.86	1218	158503.34	945
52	77567.94	306	122903.81	1217	158446.67	944
51	77549.57	306	122830.81	1216	158390.05	943
50	77531.21	306	122757.86	1215	158333.48	942
49	77512.83	306	122684.96	1215	158276.97	941
48	77494.45	306	122612.11	1214	158220.51	941
47	77476.06	307	122539.32	1213	158164.11	940
46	77457.67	307	122466.58	1212	158107.76	939
45	77439.26	307	122393.89	1211	158051.46	938
44	77420.86	307	122321.25	1210	157995.21	937
43	77402.44	307	122248.66	1209	157939.02	936
42	77384.02	307	122176.12	1208	157882.89	935
41	77365.59	307	122103.64	1207	157826.80	934
40	77347.16	307	122031.21	1206	157770.77	933
39	77328.72	307	121958.83	1206	157714.79	933
38	77310.27	307	121886.50	1205	157658.87	932
37	77291.82	308	121814.22	1204	157602.99	931
36	77273.36	308	121741.99	1203	157547.18	930
35	77254.89	308	121669.82	1203	157491.41	929
34	77236.42	308	121597.69	1202	157435.70	928
33	77217.94	308	121525.62	1201	157380.04	927
32	77199.45	308	121453.59	1200	157324.43	926
31	77180.96	308	121381.62	1199	157268.87	926
30	77162.46	308	121309.70	1198	157213.37	925

39. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	63630.26	374	82482.51	815	129627.79	519
32	63652.70	374	82531.40	815	129658.90	519
33	63675.13	374	82580.31	815	129690.04	519
34	63697.56	374	82629.25	816	129721.21	520
35	63719.98	374	82678.21	816	129752.40	520
36	63742.40	374	82727.19	817	129783.62	521
37	63764.81	373	82776.20	817	129814.87	521
38	63787.21	373	82825.23	817	129846.14	521
39	63809.61	373	82874.29	818	129877.43	522
40	63832.01	373	82923.37	818	129908.76	522
41	63854.40	373	82972.47	819	129940.11	523
42	63876.78	373	83021.60	819	129971.48	523
43	63999.16	373	83070.75	819	130002.88	524
44	63921.53	373	83119.92	820	130034.31	524
45	63943.90	373	83169.12	820	130065.76	524
46	63966.26	373	83218.34	821	130097.24	525
47	63988.62	373	83267.59	821	130128.75	525
48	64010.97	372	83316.86	821	130160.28	526
49	64033.32	372	83366.15	822	130191.84	526
50	64055.66	372	83415.47	822	130223.42	527
51	64077.99	372	83464.81	823	130255.04	527
52	64100.32	372	83514.18	823	130286.67	528
53	64122.64	372	83563.56	823	130318.34	528
54	64144.96	372	83612.98	824	130350.03	528
55	64167.28	372	83662.41	824	130381.75	529
56	64189.58	372	83711.88	825	130413.49	529
57	64211.89	372	83761.36	825	130445.26	530
58	64234.18	372	83810.87	825	130477.06	530
59	64256.47	371	83860.40	826	130508.88	531
60	64278.76	371	83909.96	826	130540.73	531

50.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	77143.95	308	121237.83	1197	157157.92	924
28	77125.44	309	121166.81	1197	157102.52	923
27	77106.92	309	121094.24	1196	157047.17	922
26	77088.39	309	121022.52	1195	156991.88	921
25	77069.86	309	120950.85	1194	156936.64	920
24	77051.32	309	120879.23	1193	156881.45	919
23	77032.78	309	120807.67	1192	156826.31	919
22	77014.23	309	120736.15	1192	156771.23	918
21	76995.67	309	120664.68	1191	156716.19	917
20	76977.10	309	120593.27	1190	156661.21	916
19	76958.53	310	120521.90	1189	156606.28	915
18	76939.95	310	120450.58	1188	156551.41	914
17	76921.37	310	120379.31	1187	156496.58	913
16	76902.78	310	120308.10	1187	156441.81	913
15	76884.18	310	120236.93	1186	156387.08	912
14	76865.58	310	120165.81	1185	156332.41	911
13	76846.97	310	120094.75	1184	156277.79	911
12	76828.35	310	120023.73	1183	156223.22	909
11	76809.73	310	119952.76	1182	156168.70	908
10	76791.10	311	119881.84	1182	156114.24	907
9	76772.46	311	119810.97	1181	156059.82	907
8	76753.82	311	119740.15	1180	156005.46	906
7	76735.17	311	119669.38	1179	155951.15	905
6	76716.51	311	119598.66	1178	155896.89	904
5	76697.85	311	119527.99	1178	155842.67	903
4	76679.18	311	119457.36	1177	155788.51	902
3	76660.51	311	119386.79	1176	155734.41	901
2	76641.83	311	119316.26	1175	155680.35	901
1	76623.14	312	119245.79	1174	155626.34	900
0	76604.44	312	119175.36	1173	155572.38	899

40. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	64301.04	371	83959.54	827	130572.60	532
2	64323.32	371	84009.15	827	130604.51	532
3	64345.59	371	84058.78	827	130636.44	532
4	64367.85	371	84108.44	828	130668.39	533
5	64390.11	371	84158.12	828	130700.38	533
6	64412.36	371	84207.82	829	130732.39	534
7	64434.61	371	84257.55	829	130764.42	534
8	64456.85	371	84307.30	829	130796.49	535
9	64479.09	371	84357.08	830	130828.58	535
10	64501.32	370	84406.88	830	130860.69	536
11	64523.55	370	84456.70	831	130892.84	536
12	64545.77	370	84506.55	831	130925.01	537
13	64567.98	370	84556.43	831	130957.20	537
14	64590.19	370	84606.32	832	130989.43	537
15	64612.40	370	84656.25	832	131021.68	538
16	64634.60	370	84706.20	833	131053.96	538
17	64656.79	370	84756.17	833	131086.26	539
18	64678.98	370	84806.17	834	131118.59	539
19	64701.16	370	84856.19	834	131150.95	540
20	64723.34	370	84906.24	834	131183.34	540
21	64745.51	369	84956.31	835	131215.75	540
22	64767.67	369	85006.40	835	131248.19	541
23	64789.83	369	85056.52	836	131280.66	541
24	64811.99	369	85106.67	836	131313.16	542
25	64834.14	369	85156.84	836	131345.68	542
26	64856.28	369	85207.04	837	131378.23	543
27	64878.42	369	85257.26	837	131410.81	543
28	64900.55	369	85307.50	838	131443.41	544
29	64922.68	369	85357.77	838	131476.04	544
30	64944.80	369	85408.07	838	131508.70	545

49. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
59	76585.74	312	119104.98	1173	155518.48	898
58	76567.03	312	119034.65	1172	155464.62	897
57	76548.32	312	118964.37	1171	155410.81	896
56	76529.60	312	118894.14	1170	155357.06	895
55	76510.87	312	118823.95	1169	155303.35	895
54	76492.14	312	118753.82	1169	155249.70	894
53	76473.40	312	118683.73	1168	155196.89	893
52	76454.65	312	118613.69	1167	155142.54	892
51	76435.90	313	118543.70	1166	155089.04	891
50	76417.14	313	118473.76	1165	155035.58	891
49	76398.37	313	118403.87	1165	154982.18	890
48	76379.60	313	118334.02	1164	154928.82	889
47	76360.82	313	118264.22	1163	154875.52	888
46	76342.04	313	118194.47	1162	154822.26	887
45	76323.25	313	118124.77	1161	154764.06	886
44	76304.45	313	118055.12	1161	154715.90	886
43	76285.64	313	117985.51	1160	154662.80	885
42	76266.83	314	117915.95	1159	154609.74	884
41	76248.01	314	117846.44	1158	154556.73	883
40	76229.19	314	117776.98	1157	154503.78	882
39	76210.36	314	117707.56	1157	154450.87	881
38	76191.52	314	117638.20	1156	154398.01	881
37	76172.68	314	117568.88	1155	154345.20	880
36	76153.83	314	117499.60	1154	154292.44	879
35	76134.97	314	117430.38	1153	154239.73	878
34	76116.11	314	117361.20	1153	154187.06	877
33	76097.24	315	117292.07	1152	154134.45	877
32	76078.37	315	117222.98	1151	154081.89	876
31	76059.48	315	117153.95	1150	154029.37	875
30	76040.60	315	117084.96	1149	153976.90	874

40.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	64966.92	369	85458.39	839	131541.39	545
32	64988.03	368	85508.73	839	131574.10	545
33	65011.14	368	85559.10	840	131606.84	546
34	65033.24	368	85609.50	840	131639.61	546
35	65055.33	368	85659.92	841	131672.40	547
36	65077.42	368	85710.37	841	131705.23	547
37	65099.50	368	85760.84	841	131738.08	548
38	65121.58	368	85811.33	842	131770.96	548
39	65143.66	368	85861.85	842	131803.86	549
40	65165.72	368	85912.40	843	131836.79	549
41	65187.78	368	85962.97	843	131869.76	540
42	65209.84	368	86013.57	844	131902.74	540
43	65231.89	367	86064.19	844	131935.76	551
44	65253.94	367	86114.84	844	131968.80	551
45	65275.97	367	86165.51	845	132001.88	551
46	65298.01	367	86216.21	845	132034.98	552
47	65320.04	367	86266.93	846	132068.10	552
48	65342.06	367	86317.68	846	132101.26	553
49	65364.08	367	86368.46	846	132134.44	553
50	65386.09	367	86419.26	847	132167.65	554
51	65408.10	367	86470.09	847	132200.89	554
52	65430.10	367	86520.94	848	132234.16	555
53	65452.09	367	86571.81	848	132267.45	555
54	65474.08	366	86622.72	849	132300.77	556
55	65496.06	366	86673.65	849	132334.13	556
56	65518.04	366	86724.60	849	132367.50	557
57	65540.02	366	86775 58	850	132391.91	557
58	65561.98	366	86826.58	850	132434.35	558
59	65583.95	366	86877.62	851	132467.81	558
60	65605.90	366	86928.67	851	132501.30	558

49.Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
29	76021.79	315	117016.01	1149	153924.49	873
28	76002.80	315	116947.12	1148	153872.12	872
27	75983.89	315	116878.27	1147	153819.80	872
26	75964.98	315	116809.47	1146	153767.52	871
25	75946.06	315	116740.71	1146	153715.30	870
24	75927.13	315	116672.00	1145	153663.12	869
23	75908.20	316	116603.34	1144	153611.00	868
22	75889.26	316	116534.72	1143	153558.92	868
21	75870.31	316	116466.15	1142	153506.89	867
20	75851.36	316	116397.63	1142	153454.91	866
19	75832.40	316	116329.16	1141	153402.97	865
18	75813.43	316	116260.73	1140	153351.09	864
17	75794.46	316	116192.34	1139	153299.25	864
16	75775.48	316	116124.00	1139	153247.46	863
15	75756.50	316	116055.71	1138	153195.72	862
14	75737.51	317	115987.47	1137	153144.03	861
13	75718.51	317	115919.27	1136	153092.38	860
12	75699.51	317	115851.11	1136	153040.78	860
11	75680.49	317	115783.01	1135	152989.23	859
10	75661.48	317	115714.95	1134	152937.73	858
9	75642.45	317	115646.93	1133	152886.27	858
8	75623.42	317	115578.96	1133	152834.87	856
7	75604.39	317	115511.04	1132	152783.51	856
6	75585.35	317	115443.16	1131	152732.19	855
5	75566.30	318	115375.32	1130	152680.93	854
4	75547.24	318	115307.54	1129	152629.71	853
3	75528.18	318	115239.79	1129	152578.54	853
2	75509.11	318	115172.10	1128	152527.41	852
1	75490.04	318	115104.45	1127	152476.34	851
[illegible]	75470.96	318	115036.84	1126	152425.31	850

41. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	65627.85	366	86979.76	852	132534.82	559
2	65649.80	366	87030.87	852	132568.37	559
3	65671.74	366	87082.00	852	132601.94	560
4	65693.67	366	87133.16	853	132635.54	560
5	65715.60	365	87184.35	853	132669.18	561
6	65737.52	365	87235.56	854	132702.84	561
7	65759.44	365	87286.80	854	132736.52	562
8	65781.35	365	87338.06	855	132770.24	562
9	65803.26	365	87389.35	855	132803.99	563
10	65825.16	365	87440.67	856	132837.76	563
11	65847.06	365	87492.01	856	132871.56	564
12	65868.95	365	87543.38	856	132905.39	564
13	65890.83	365	87594.78	857	132939.25	565
14	65912.71	365	87646.20	857	132973.14	565
15	65934.58	364	87697.65	858	133007.06	566
16	65956.45	364	87749.12	858	133041.00	566
17	65978.31	364	87800.62	859	133074.97	566
18	66000.17	364	87852.15	859	133108.98	567
19	66022.02	364	87903.70	859	133143.01	567
20	66043.86	364	87955.28	860	133177.07	568
21	66065.70	364	88006.88	860	133211.15	568
22	66087.54	364	88058.52	861	133245.27	569
23	66109.36	364	88110.17	861	133279.42	569
24	66131.19	364	88161.86	862	133313.59	570
25	66153.00	364	88213.57	862	133347.79	570
26	66174.81	363	88265.31	863	133382.02	571
27	66196.62	363	88317.07	863	133416.29	571
28	66218.42	363	88368.86	863	133450.58	572
29	66240.22	363	88420.68	864	133484.89	572
30	66262.00	363	88472.53	864	133519.24	573

48. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
59	75451.87	318	114969.28	1126	152374.33	849
58	75432.78	318	114901.76	1125	152323.39	849
57	75413.68	318	114834.29	1124	152272.50	848
56	75394.57	318	114766.87	1123	152221.66	847
55	75375.46	319	114699.49	1123	152170.87	846
54	75356.34	319	114632.15	1122	152120.12	845
53	75337.21	319	114564.86	1121	152069.42	845
52	75318.08	319	114497.62	1120	152018.76	844
51	75298.94	319	114430.41	1120	151968.15	843
50	75279.80	319	114363.26	1119	151917.59	842
49	75260.65	319	114296.15	1118	151867.08	842
48	75241.49	319	114229.08	1117	151816.61	841
47	75222.33	319	114162.06	1117	151766.19	840
46	75203.16	320	114095.08	1116	151715.81	839
45	75183.98	320	114028.15	1115	151665.48	838
44	75164.80	320	113961.26	1115	151615.20	838
43	75145.61	320	113894.41	1114	151564.96	837
42	75126.41	320	113827.61	1113	151514.77	836
41	75107.21	320	113760.85	1112	151464.62	835
40	75088.00	320	113694.14	1112	151414.52	835
39	75068.79	320	113627.47	1111	151364.47	834
38	75049.57	320	113560.85	1110	151314.46	833
37	75030.34	320	113494.27	1109	151264.50	832
36	75011.11	321	113427.73	1108	151214.59	832
35	74991.87	321	113361.24	1107	151164.72	831
34	74972.62	321	113294.79	1107	151114.89	830
33	74953.37	321	113228.39	1106	151065.11	829
32	74934.11	321	113162.03	1105	151015.38	829
31	74914.84	321	113095.71	1104	150965.69	828
30	74895.57	321	113029.44	1104	150916.69	827

41.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	66283.79	363	88524.40	865	133553.62	573
32	66305.57	363	88576.29	865	133588.02	574
33	66327.34	363	88628.22	866	133622.46	574
34	66349.10	363	88680.17	866	133656.92	575
35	66370.87	363	88732.15	867	133691.41	575
36	66392.62	363	88784.15	867	133725.94	576
37	66414.37	362	88836.19	867	133760.49	576
38	66436.11	362	88888.24	868	133795.07	577
39	66457.85	362	88940.33	868	133829.68	577
40	66479.59	362	88992.44	869	133864.32	578
41	66501.31	362	89044.58	869	133898.98	578
42	66523.03	362	89096.75	870	133933.68	579
43	66544.75	362	89148.94	870	133968.41	579
44	66566.46	362	89201.16	871	134003.16	580
45	66588.17	362	89253.41	871	134037.95	580
46	66609.87	362	89305.69	871	134072.76	581
47	66631.56	361	89357.99	872	134107.61	581
48	66653.25	361	89410.32	872	134142.48	582
49	66674.93	361	89462.68	873	134177.38	582
50	66696.61	361	89515.06	873	134212.32	582
51	66718.28	361	89567.47	874	134247.28	583
52	66739.94	361	89619.91	874	134282.27	583
53	66761.60	361	89672.37	875	134317.29	584
54	66783.25	361	89724.87	875	134352.34	584
55	66804.90	361	89777.39	876	134387.42	585
56	66826.55	361	89829.94	876	134422.53	585
57	66848.18	361	89882.51	877	134457.67	586
58	66869.81	360	89935.12	877	134492.84	586
59	66891.44	360	89987.75	877	134528.04	587
60	66913.06	360	90040.40	878	134563.27	587

48. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	74876.29	321	112963.21	1104	150866.45	826
28	74857.01	321	112897.02	1103	150816.90	826
27	74837.72	322	112830.88	1102	150767.39	825
26	74818.42	322	112764.78	1101	150717.93	824
25	74799.12	322	112698.72	1100	150668.52	823
24	74779.81	322	112632.71	1100	150619.15	823
23	74760.49	322	112566.74	1099	150569.82	822
22	74741.17	322	112500.81	1098	150520.54	821
21	74721.84	322	112434.93	1097	150471.31	820
20	74702.51	322	112369.09	1097	150422.11	820
19	74683.17	322	112303.29	1096	150372.97	819
18	74663.82	322	112237.54	1096	150323.87	818
17	74644.46	323	112171.83	1095	150274.81	817
16	74625.10	323	112106.16	1094	150225.80	817
15	74605.74	323	112040.53	1093	150176.83	816
14	74586.36	323	111974.95	1093	150127.91	815
13	74566.98	323	111909.41	1092	150079.03	814
12	74547.60	323	111843.41	1091	150030.20	814
11	74528.21	323	111778.46	1091	149981.41	813
10	74508.81	323	111713.05	1090	149932.67	812
9	74489.41	323	111647.68	1089	149883.97	811
8	74469.99	324	111582.35	1088	149835.31	811
7	74450.58	324	111517.06	1088	149786.70	810
6	74431.15	324	111451.82	1087	149738.13	809
5	74411.72	324	111386.62	1086	149689.61	808
4	74392.29	324	111321.46	1086	149641.13	808
3	74372.85	324	111256.35	1085	149592.70	807
2	74353.40	324	111191.27	1084	149544.30	806
1	74333.94	324	111126.24	1084	149495.96	805
0	74314.48	324	111061.25	1083	149447.65	805

42. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	66934.67	360	90093.09	878	134598.53	588
2	66956.28	360	90145.80	879	134633.82	588
3	66977.89	360	90198.54	879	134669.14	589
4	66999.48	360	90251.31	880	134704.49	589
5	67021.08	360	90304.11	880	134739.87	590
6	67042.66	360	90356.93	881	134775.28	590
7	67064.24	360	90409.79	881	134810.72	591
8	67085.82	360	90462.66	882	134846.19	591
9	67107.39	359	90515.57	882	134881.68	592
10	67128.95	359	90568.51	883	134917.21	592
11	67150.51	359	90621.47	883	134952.77	593
12	67172.06	359	90674.46	883	134988.36	593
13	67193.60	359	90727.48	884	135023.98	594
14	67215.15	359	90780.53	884	135059.63	594
15	67236.68	359	90833.60	885	135095.31	595
16	67258.21	359	90886.71	885	135131.02	595
17	67279.73	359	90939.84	886	135166.76	596
18	67301.25	359	90993.00	886	135202.54	596
19	67322.76	358	91046.19	887	135238.34	597
20	67344.27	358	91099.40	887	135274.17	597
21	67366.77	358	91152.65	888	135310.03	598
22	67387.27	358	91205.92	888	135345.93	598
23	67409.75	358	91259.22	889	135381.85	599
24	67430.24	358	91312.55	889	135417.80	599
25	67451.72	358	91365.90	890	135453.79	600
26	67473.19	358	91419.29	890	135489.80	600
27	67494.65	358	91472.70	890	135525.85	601
28	67516.12	358	91526.15	891	135561.92	602
29	67537.57	358	91579.62	891	135598.03	602
30	67559.02	357	91633.12	892	135634.17	603

47. Grad.

Prima	Sinus	10"	Tangens	10"	Secans	10"
59	74295.01	324	110996.30	1082	149399.40	804
58	74275.54	325	110931.40	1081	149351.18	803
57	74256.06	325	110866.53	1081	149303.01	803
56	74236.57	325	110801.71	1080	149254.88	802
55	74217.08	325	110736.93	1079	149206.80	801
54	74197.58	325	110672.19	1079	149158.75	800
53	74178.08	325	110607.50	1078	149110.76	800
52	74158.57	325	110542.84	1077	149062.80	799
51	74139.05	325	110478.23	1077	149014.89	798
50	74119.53	325	110413.65	1076	148967.03	797
49	74100.00	326	110349.12	1075	148919.20	797
48	74080.46	326	110284.63	1075	148871.42	796
47	74060.92	326	110220.19	1074	148823.69	795
46	74041.37	326	110155.78	1073	148775.99	795
45	74021.81	326	110091.41	1072	148728.34	794
44	74002.25	326	110027.09	1072	148680.73	793
43	73982.68	326	109962.81	1071	148633.17	792
42	73963.11	326	109898.56	1070	148585.65	792
41	73943.53	326	109834.36	1069	148538.17	791
40	73923.94	326	109770.20	1069	148490.73	790
39	73904.35	327	109706.08	1068	148443.34	790
38	73884.75	327	109642.01	1068	148395.99	789
37	73865.15	327	109577.97	1067	148348.68	788
36	73845.53	327	109513.97	1066	148301.42	787
35	73825.92	327	109450.02	1066	148254.20	787
34	73806.29	327	109386.10	1065	148207 02	786
33	73786.66	327	109322.23	1064	148157.88	785
32	73767.02	327	109258.40	1064	148112.78	785
31	73747.38	327	109194.60	1063	148065.73	784
03	73727.73	328	109130.85	1062	148018.72	783

42. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	67580.46	357	91686.64	892	135670.34	603
32	67601.90	357	91740.20	893	135706.54	604
33	67623.33	357	91793.79	893	135742.77	604
34	67644.76	357	91847.40	894	135779.03	605
35	67666.18	357	91901.04	894	135815.32	605
36	67687.60	357	91954.71	895	135851.64	606
37	67709.01	357	92008.41	895	135888.00	606
38	67730.41	357	92062.14	896	135924.38	607
39	67751.81	357	92115.90	896	135960.80	607
40	67773.20	356	92169.68	897	135997.25	608
41	67794.59	356	92223.50	897	136033.73	608
42	67815.97	356	92277.34	898	136070.23	609
43	67837.34	356	92331.22	898	136106.77	609
44	67858.71	356	92385.12	899	136143.34	610
45	67880.07	356	92439.05	899	136179.95	610
46	67901.43	356	92493.10	900	136216.58	611
47	67922.78	356	92547.00	900	136253.24	611
48	67944.13	356	92601.01	901	136289.94	612
49	67965.47	356	92655.06	901	136326.67	612
50	67986.81	356	92709.14	902	136363.43	613
51	68008.13	355	92763.24	902	136400.22	613
52	68029.46	355	92817.38	903	136437.04	614
53	68050.77	355	92871.54	903	136473.89	615
54	68072.09	355	92925 73	903	136510.78	615
55	68093.39	355	92979.96	904	136547.70	616
56	68144.69	355	93034.21	904	136584.64	616
57	68135.99	355	93088.49	905	136621.62	617
58	68157.28	355	93142.80	905	136658.63	617
59	68178.56	355	93197.14	906	136695.67	718
60	68199.84	355	93251.51	906	136732.75	618

47.Grad.

Prima	Sinus	10''	Tangens	10''	Secans	10''
29	73708.08	328	109067.14	1062	147971.76	782
28	73688.42	328	109003.47	1061	147924.83	782
27	73668.75	328	108939.83	1060	147877.95	781
26	73649.07	328	108876.24	1060	147831.11	780
25	73629.39	328	108812.69	1059	147784.31	780
24	73609.71	328	108749.18	1058	147737.55	779
23	73590.02	328	108685.71	1058	147690.84	778
22	73570.32	328	108622.28	1057	147644.17	778
21	73550.61	328	108558.89	1056	147597.54	777
20	73530.90	329	108495.54	1056	147550.95	776
19	73511.18	329	108432.23	1055	147504.40	775
18	73491.46	329	108368.96	1054	147457.90	775
17	73471.73	329	108305.73	1054	147411.44	774
16	73451.99	329	108242.54	1053	147365.01	773
15	73432.25	329	108179.39	1052	147318.64	773
14	73412.50	329	108116.28	1052	147272.30	772
13	73392.75	329	108053.21	1051	147226.00	771
12	73372.99	329	107990.18	1050	147179.75	771
11	73353.22	329	107927.18	1050	147133.53	770
10	73333.45	330	107864.23	1049	147087.36	769
9	73313.67	330	107801.32	1048	147041.23	769
8	73293.88	330	107738.44	1048	146995.14	768
7	73274.09	330	107675.61	1047	146949.10	767
6	73254.29	330	107612.82	1046	146903.09	766
5	73234.48	330	107550.06	1046	146857.13	766
4	73214.67	330	107487.34	1045	146811.20	765
3	73194.86	330	107424.67	1044	146765.32	764
2	73175.03	330	107362.03	1044	146719.48	764
1	73155.21	331	107299.43	1043	146673.68	763
0	73135.37	331	107236.87	1042	146627.92	762

43. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
1	68221.00	354	93305.91	907	136769.85	619
2	68242.37	354	93360.34	907	136806.99	619
3	68263.63	354	93414.79	908	136844.16	620
4	68284.89	354	93469.28	908	136881.36	620
5	68306.13	354	93523.80	909	136918.59	621
6	68327.38	354	93578.34	909	136955.86	621
7	68348.61	354	93632.92	910	136993.15	622
8	68369.84	354	93687.53	910	137030.48	622
9	68341.07	354	93742.16	911	137067.84	623
10	68412.29	353	93796.83	911	137105.23	624
11	68433.50	353	93851.52	912	137142.66	624
12	68454.71	353	93906.25	912	137180.11	625
13	68475.91	353	93961.01	913	137217.60	625
14	68497.11	353	94015.79	913	137255.12	626
15	68518.30	353	94070.61	914	137292.68	626
16	68539.48	353	94125.45	914	137330.26	627
17	68560.66	353	94180.33	915	137367.88	627
18	68581.83	353	94235.23	915	137405.53	628
19	68603.00	353	94290.17	916	137443.21	628
20	68624.16	353	94345.13	916	137480.92	629
21	68645.32	353	94400.13	917	137518.67	629
22	68666.47	352	94455.16	917	137556.45	630
23	68687.61	352	94510.21	918	137594.26	630
24	68708.75	352	94565.30	918	137632.10	631
25	68729.88	352	94620.42	919	137669.98	632
26	68751.10	352	94675.56	919	137707.89	632
27	68772.13	352	94730.74	920	137745.83	633
28	68793.24	352	94785.95	920	137783.80	633
29	68814.35	352	94841.19	921	137821.81	634
30	68835.46	352	94896.46	921	137859.85	634

46. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
59	73115.53	331	107174.35	1042	146582.20	762
58	73095.68	331	107111.87	1041	146536.52	761
57	73075.83	331	107049.43	1040	146490.88	760
56	73055.97	331	106987.02	1040	146445.29	760
55	73036.10	331	106924.66	1039	146399.73	759
54	73016.23	331	106862.33	1038	146354.22	758
53	72996.35	331	106800.04	1038	146308.75	758
52	72976.46	331	106737.79	1037	146263.31	757
51	72956.57	332	106675.58	1037	146217.92	757
50	72936.68	332	106613.41	1036	146172.57	756
49	72916.77	332	106551.28	1035	146127.26	755
48	72896.86	332	106489.18	1035	146081.98	754
47	72876.95	332	106427.13	1034	146036.75	754
46	72857.02	332	106365.11	1033	145991.56	753
45	72837.10	332	106303.13	1033	145946.41	752
44	72817.16	332	106241.19	1032	145901.30	752
43	72797.22	332	106179.29	1031	145856.23	751
42	72777.28	332	106117.42	1031	145811.20	750
41	72757.32	333	106055.60	1030	145766.21	750
40	72737.36	333	105993.81	1030	145721.27	749
39	72717.40	333	105932.06	1029	145672.36	748
38	72697.43	333	105870.34	1028	145631.49	748
37	72677.45	333	105808.67	1028	145586.66	747
36	72657.47	333	105747.03	1027	145541.87	746
35	72637.48	333	105685.44	1026	145497.12	746
34	72617.48	333	105623.88	1026	145422.41	745
33	72597.48	333	105562.35	1025	145407.74	744
32	72577.47	334	105500.87	1024	145363.11	744
31	72557.46	334	105439.42	1024	145318.52	743
30	72537.44	334	105378.01	1023	145273.97	742

43.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	68856.55	352	94951.76	922	137897.92	635
32	68877.65	351	95007.09	922	137936.02	635
33	68898.73	351	95062.45	923	137974.16	636
34	68919.81	351	95117.84	923	138012.33	636
35	68940.89	351	95173.26	924	138050.53	637
36	68961.95	351	95228.71	924	138088.77	638
37	68983.02	351	95284.20	925	138127.04	638
38	69004.07	351	95339.71	926	138165.34	639
39	69025.12	351	95395.26	926	138203.67	639
40	69046.17	351	95450.83	927	138242.04	640
41	69067.21	351	95506.44	927	138280.44	640
42	69088.24	350	95562.08	928	138318.87	641
43	69109.27	350	95617.74	928	138357.34	641
44	69130.29	350	95673.44	929	138395.84	642
45	69151.31	350	95729.17	929	138434.37	643
46	69172.31	350	95784.94	930	138472.94	643
47	69193.32	350	95840.73	930	138511.53	644
48	69214.32	350	95896.55	931	138550.17	644
49	69235.31	350	95952.41	931	138588.83	645
50	69256.30	350	96008.29	932	138627.53	645
51	69277.28	350	96064.21	932	138666.26	646
52	69298.25	350	96120.16	933	138705.03	646
53	69319.22	349	96176.14	933	138743.83	647
54	69340.18	349	96232.15	934	138782.66	648
55	69361.14	349	96288.19	934	138821.53	648
56	69382.09	349	96344.27	935	138860.42	649
57	69403.04	349	96400.37	935	138899.36	649
58	69423.98	349	96456.51	936	138938.32	650
59	69444.91	349	96512.68	936	138977.32	650
60	69465.84	349	96568.88	937	139016.36	651

46. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	72517.41	334	105316.64	1023	145229.46	742
28	72497.38	334	105255.31	1022	145184.98	741
27	72477.34	334	105194.01	1021	145140.55	740
26	72457.29	334	105132.75	1020	145096.16	740
25	72437.24	334	105071.53	1020	145051.80	739
24	72417.19	334	105010.34	1019	145007.49	738
23	72397.12	334	104949.20	1019	144963.22	738
22	72377.05	335	104888.09	1018	144918.98	737
21	72356.98	335	104827.02	1018	144874.78	736
20	72336.90	335	104765.98	1017	144830.63	736
19	72316.81	335	104704.98	1016	144786.51	735
18	72296.71	335	104644.02	1016	144742.43	734
17	72276.61	335	104583.10	1015	144698.39	734
16	72256.51	335	104522.21	1015	144654.39	733
15	72236.40	335	104461.36	1014	144610.43	732
14	72216.28	335	104400.55	1013	144566.51	732
13	72196.15	335	104339.77	1013	144522.62	731
12	72176.02	336	104279.04	1012	144478.78	730
11	72155.89	336	104218.33	1011	144434.97	730
10	72135.74	336	104157.67	1011	144391.20	729
9	72115.59	336	104097.04	1010	144347.48	729
8	72095.44	336	104036.45	1010	144303.79	728
7	72075.28	336	103975.89	1009	144260.13	727
6	72055.11	336	103915.37	1008	144216.52	727
5	72034.94	336	103854.89	1008	144172.95	726
4	72014.76	336	103794.45	1007	144129.41	725
3	71994.57	336	103734.04	1007	144085.91	725
2	71974.38	337	103673.67	1006	144042.46	724
1	71954.18	337	103613.33	1005	143999.04	723
0	71938.98	337	103553.03	1005	143955.65	723

44. Grad.

Minut.	Sinus	10"	Tangens	10"	Secans	10"
1	69486.76	349	96625.11	937	139055.43	651
2	69507.67	349	96681.37	938	139094.53	652
3	69528.58	348	96737.67	938	139133.66	653
4	69549.49	348	96793.99	939	139172.83	653
5	69570.39	348	96850.35	940	139214.03	654
6	69591.28	348	96906.74	940	139251.27	654
7	69612.17	348	96963.16	941	139290.54	655
8	69633.05	348	97019.62	941	139329.85	655
9	69653.92	348	97076.10	942	139369.18	656
10	69674.79	348	97132.62	942	139408.56	657
11	69695.65	348	97189.17	943	139447.96	657
12	69716.51	348	97245.75	943	139487.40	658
13	69737.36	347	97302.36	944	139526.88	658
14	69758.21	347	97359.01	944	139566.39	659
15	69779.05	347	97415.69	645	139605.93	659
16	69799.88	347	97472.40	945	139645.51	660
17	69820.71	347	97529.14	946	139685.12	661
18	69841.53	347	97585.91	947	139724.77	661
19	69862.34	347	97642.72	947	139764.45	662
20	69883.15	347	97699.56	948	139804.16	662
21	69903.96	347	97756.43	948	139843.91	663
22	69924.75	346	97813.33	949	139883.69	663
23	69945.55	346	97870.27	949	139923.51	664
24	69966.33	346	97927.23	950	139963.36	665
25	69987.11	346	97984.24	950	140003.25	665
26	70007.89	346	98041.27	951	140034.17	666
27	70028.66	346	98098.33	951	140083.13	666
28	70049.42	346	98155.43	952	140123.12	667
29	70070.18	346	98212.56	952	140163.15	667
30	70090.93	346	98269.73	953	140203.21	668

45. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
59	71913.77	337	103492.77	1004	143912.31	722
58	71893.55	337	103432.54	1003	143869.00	721
57	71873.33	337	103372.35	1003	143852.74	721
56	71853.10	337	103312.20	1002	143782.51	720
55	71832.87	337	103252.08	1002	143739.32	720
54	71812.63	337	103191.99	1001	143696.16	719
53	71792.38	337	103131.95	1001	143653.05	718
52	71772.13	338	103071.94	1000	143609.97	718
51	71751.87	338	103011.96	999	143566.93	717
50	71731.61	338	102952.03	999	143523.93	716
49	71711.34	338	102892.12	998	143480.97	716
48	71691.06	338	102832.26	998	143438.05	715
47	71670.78	338	102772.42	997	143395.16	715
46	71650.49	338	102712.63	996	143352.31	714
45	71630.19	338	102652.87	996	143309.50	713
44	71609.89	338	102593.15	995	143266.72	713
43	71580.59	338	102533.46	995	143223.99	712
42	71569.27	339	102473.81	994	143181.29	711
41	71548.95	339	102414.19	993	143138.63	711
40	71528.63	339	102354.61	993	143096.00	710
39	71508.30	339	102295.06	992	143053.42	710
38	71487.96	339	102235.55	992	143010.87	709
37	71467.62	339	102176.08	991	142968.36	708
36	71447.27	339	102116.64	990	142925.88	708
35	71426.91	339	102057.23	990	142883.44	707
34	71406.55	339	101997.86	989	142871.05	706
33	71386.18	339	101938.53	989	142798.68	706
32	71365.81	340	101879.23	988	142756.36	705
31	71345.43	340	101819.97	987	142714.07	705
30	71325.04	340	101760.74	987	142671.82	704

44. Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
31	70111.67	346	198326.92	954	140243.30	669
32	70132.41	346	198384.15	954	140283.43	669
33	70153.14	345	198441.41	955	140323.60	670
34	70173.87	345	198498.71	955	140363.80	670
35	70194.59	345	198556.03	956	140404.03	671
36	70215.30	345	198613.39	956	140444.30	671
37	70236.01	345	198670.79	957	140484.60	672
38	70256.72	345	198728.21	957	140524.94	673
39	70277.41	345	198785.67	958	140565.32	673
40	70298.11	345	198843.16	959	140605.73	674
41	70318.79	345	198900.69	959	140646.17	674
42	70339.47	345	198958.25	960	140686.65	675
43	70360.14	344	199015.84	960	140727.17	676
44	70380.81	344	199073.46	961	140767.72	676
45	70401.47	344	199131.12	661	140808.31	677
46	70422.13	344	199188.81	962	140848.93	677
47	70442.78	344	199246.54	962	140889.58	678
48	70463.42	344	199304.29	963	140930.28	679
49	70484.06	344	199362.08	963	140971.00	679
50	70504.69	344	199419.91	964	141011.77	680
51	70525.32	344	199477.77	965	141052.56	680
52	70545.94	344	199535.66	965	141093.40	681
53	70566.55	343	199593.58	966	141134.27	681
54	70587.16	343	199651.54	966	141175.17	682
55	70607.76	343	199709.53	967	141216.11	683
56	70628.35	343	199767.56	967	141257.09	683
57	70648.94	343	199825.62	968	141298.10	684
58	70669.53	343	199883.71	969	141339.15	684
59	70690.11	343	199941.84	969	141380.24	685
60	70710.68	343	100000.00	969	141421.36	685

45.Grad.

Prima	Sinus	10″	Tangens	10″	Secans	10″
29	71304.65	340	101701.55	986	142629.61	703
28	71284.26	340	101642.39	986	142587.43	703
27	71263.85	340	101583.26	985	142545.29	702
26	71243.44	340	101524.17	985	142503.19	701
25	71223.03	340	101465.12	984	142461.12	701
24	71202.60	340	101406.10	983	142419.09	700
23	71182.18	340	101347.12	982	142377.10	790
22	71161.74	341	101288.17	982	142335.14	699
21	71141.30	341	101229.25	982	142293.23	698
20	71120.86	341	101170.37	981	142251.34	698
19	71100.40	341	101111.53	981	142209.50	697
18	71079.95	341	101052.72	980	142167.69	697
17	71059.48	341	100993.94	979	142125.92	696
16	71039.01	341	100935.20	979	142084.18	695
15	71018.54	341	100876.49	978	142042.48	695
14	70998.06	341	100817.82	978	142000.82	694
13	70977.57	341	100759.18	977	141959.19	694
12	70957.07	342	100700.58	976	141917.61	693
11	70936.57	342	100642.01	976	141876.05	692
10	70916.07	342	100583.47	975	141834.54	692
9	70895.56	342	100524.97	975	141793.05	691
8	70875.04	342	100466.51	974	141751.61	690
7	70854.51	342	100408.07	974	141710.20	690
6	70833.98	342	100349.68	973	141668.83	689
5	70813.45	342	100291.31	972	141627.49	689
4	70792.91	342	100232.98	972	141586.19	688
3	70772.36	342	100174.69	971	141544.93	687
2	70751.80	343	100116.42	971	141503.70	687
1	70731.24	343	100058.19	970	141462.51	686
0	70710.68	343	100000.00	970	141421.36	686

Errata Canonis.

A.2 ſinu 57″.pro 994.lege 894.Tang. 51′.pro 321.lege 311. Tang. 45′. pro 740. lege 750.

A.4. Tang. 8″.pro 66.l.64. Secant. 38′.pro 442 l.424.

B.2. ſin. 18″. pro 68. l.08.0″.pro 92.l. 93. Tang.0″.pro 96.lege 94. Sec.54″. pro 96.l.95.30″.pro 95.l.98.

B.3. Tang.54″.pro 82.l.83.52″.pro.23. l.53.facie.2.ſinu & Tang.16″.pro 29.l.20.

B.4. Secant.52″.pro 043.l.118,50.pro 6984.l.7059.48′.pro.464.l.540.facie 2. Secant.48″.pro 93.l.63.

C.1. Tang.6″.pro 90.l.60.

C.2. Tang.54″.pro 10.l.99. Secant.0″. pro 99.l.97.

C.3. Tang.22″.pro 770.l.377.16″.pro 937.l.634.14″.pro 362.l.392.

C.4. Secant.12″.pro 896.l.096.facie.2. ſinu.16′.10″.pro 39.l.29.

D.1. Secant.46′.50″.pro 99.l.09.

D.2. ſinu.43′.0″.pro 130.l.730. Tang. 23′.30″.pro 50.l.60. Sec.42′.0″.pro 906.l.986.in frontiſpicio pro 1″.1″:l. 10″.10″.

D.3. Tang.37′.50″.pro 07.l.17.Sec.36′. 50″.pro 13.l.03.

D.4. prima 31.32.33.34. colloca ſupra lineolas. Secant.33′.30″.pro 958.l. 758.32′.0″.pro 897.l.780.facie.2.in titulis.pro 1″.1′.l.10″.10″.ſinu.33′. 10″.pro 70.l.76.

E.4. in titulis.pro 1′.l.10″.Sec.12′.0″. pro 65.l.05. facie.2.ſin 51′.40″.pro 14.l.15.

F.1. Tang.7′.10″.pro 95.l.65. facie 2. Tang.56′.30″.pro 46.l.43.

F.2. Secant.0′.0″.pro 89.l.98.

F.3. ſinu.47′.pro 75.l.45. 45′.pro 21. l.20.38′.pro penult 5.l.3.31′.pro 64.l 66.facie 2 ſin.30′.pro 59.l.40.

F.4. facie.2.ſinu.20′.pro 40.l.31.26′. pro 285.l.245.

G.1. in titulis,pro 1″.1″.l.10″.10″.facie. 2.Tang.45.pro 489.l.480.Secant. 43.pro 162.l.112.

G.2. ſinu.25′.pro 17.l.37.

G.4. dele incremẽta, poſt ſinus.in titulis pro 1″.1″.l.10″.10″. Sinu 27′.pro 800′.l.808.17′.pro 83.l.89.

H.1. ſinu.58′.pro 20.l.30.31′.pro.21.l. 01. Tang.51′.pro 79.l.78.facie.2. Secant.54.pro 20.l.11.

H.3. in titulis.pro 1″.1′.l.10″.10″.

I.1. Secant.41.pro 907.l.897.facie.2. ſin.40′.pro 127.l.117.

I.2. Tang.17′.pro 22.l.72.12′.pro 665.l.862.

I.3. Sec.44′.pro 29.l.79.37′.pro 69. l.97.34′.pro 66.l.61.facie.2.Tang. 36′.pro 45.l.85.

I. 4. Sec. 14. pro 802. l. 798.
K. 1. ſin. 52'. pro 62. l. 52. Tang. 42. pro 567. l. 547.
K. 2. Tang. 19'. pro 12. l. 72. Sec. 2'. pro 2787. l. 1602.
K. 3. facie. 2. ſin. 58. pro 22. l. 53.
L. 1. ſin. 55'. pro 05. l. 15.
L. 2. facie. 2 ſinu ult. pro 76. l. 79. Secant. 15'. pro 26. l. 16. 30'. pro 101. l. 102.
L. 3. ſinu. 46'. pro 81. l. 84. Tang. 45. pro 9. l. 2. pro 95. l. 50.
L. 4. ſinu. 4'. pro 28. l. 20.
M. 3. ſinu. 37'. pro 45. l. 25. Tang. 47. pro 70. l. 01. facie. 2. Tang. 49'. pro 50. l. 20.
M. 4. ſinu. 14' pro 09. l. 89.
N. 2. ſinu. 17'. pro 11. l. 19. facie. 2. ſinu. 16. pro 68. l. 38.
N. 3. ſinu. 33'. pro 83. l. 86. facie. 2. ſin. 55'. pro 13. l. 23. Sec. 57'. pro 4. 9. l. 3. 9.
N. 4. ſinu 16'. pro 54. l. 53.
O. 3. ſinu. 53'. pro 76. l. 70. facie. 2. Sec. 57'. pro 308. l. 457. 58'. pro 790. l. 368. 59'. pro 46272. l. 36290.
O. 4. facie. 2. Tang. 14'. pro 21'. l. 29.
P. 2. ſin. 5'. pro 99. l. 90. facie 2. Tang. 28'. pro 356. l. 346.
Q. 1. facie 2. Tang. 32'. pro 58. l. 54. 54'. pro 80. l. 86. Sec. 60'. pro 509. lege 499.
Q. 2. ſinu. 18'. pro 83. lege 03. Tang. 11. pro ult. 0. l. 6. facie 2. ſin. 14. pro 17. l. 16.
Q. 4. ſinu. 28'. pro. 4189. l. 0419. facie. 2. Secant. 1'. pro 166. l. 156.
R. 1. ſinu. 55'. pro 68. l. 63. ſinu. 54'. pro 54. l. 52. Tang. 54'. pro 57. l. 27. facie. 2. ſin. 43'. pro 67. l. 61.
R. 2. ſin. 22'. pro 94. l. 64. 14'. l. 92208. 844. Sec. 3'. pro 37. l. 81.
R. 4. ſin. 16'. pro 65. l. 85. Tang. 16. pro 49. l. 46.
In parte prop. Tang. hîc & S. 1. facie 2. dele ultimum quemq; numerum.
S. 1. ſin. 31'. pro 086. l. 186. facie. 2. Sec. 48'. pro 65. l. 55. 51'. pro 43. l. 34.
S. 2. ſinu. 22'. pro 738. l. 377. facie. 2. ſinu. 4'. pro 357. l. 367.
S. 4. ſin. 9'. pro. 92'. l. 93.
T. 2. Tang. 19'. pro 0472. l. 7204.
T. 4. facie. 2'. Sec. 16'. pro 23. 9. l. 39. 2.
V. 2. Tang. 28'. pro 60. l. 50. Sec. 20'. pro 9. l. 0.
V. 3. ſin. 47'. pro 28. l. 13.
X. 2. ſin. 10'. pro 68. l. 66. 1'. pro 131. l. 171. facie 2. Tang. 25'. pro 86. l. 80.
Y. 4. Tang. 3'. pro 63. l. 54.
Z. 3. Tang. 59'. pro 36. l. 26. facie. 2. ſinu. 48. pro 05. l. 95.
Aa. facie 2. ſinu. 38. pro 59. l. 69.
Aa. 4. ſinu. 25'. pro 91. l. 71. 11'. pro 96. l. 97. 10'. pro 33. l. 83.
Bb. 2. ſin. 21'. pro 77. l. 97.
Bb. 3. ſin. 43'. pro 639. l. 638.

Cc. Sec. 45'. pro 64. l. 69. facie. 2. ſinu. 32'. pro 88. l. 89.

Cc. 3. Secant. 30'. pro 69. l. 05.

Cc. 4. facie. 2. ſin. 21'. pro 66. l. 65. 23'. pro 975. l. 876.

Dd. 1. facie. 2. ſinu 56'. pro 44. l. 14.

Dd. 2. facie. 2. ſinu. 1'. pro 00. l. 11. 9'. pro 34. l. 3. 26'. pro 10. l. 01.

Dd. 4. facie. 2. Secant. 4'. pro 14. l. 12.

Ee. 1. ſinu 43'. pro 80. l. 89. Secant. 57'. pro 52. l. 25.

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